TURBONutter

Lada Niva 4x4
Service Manual
Fuel Injection

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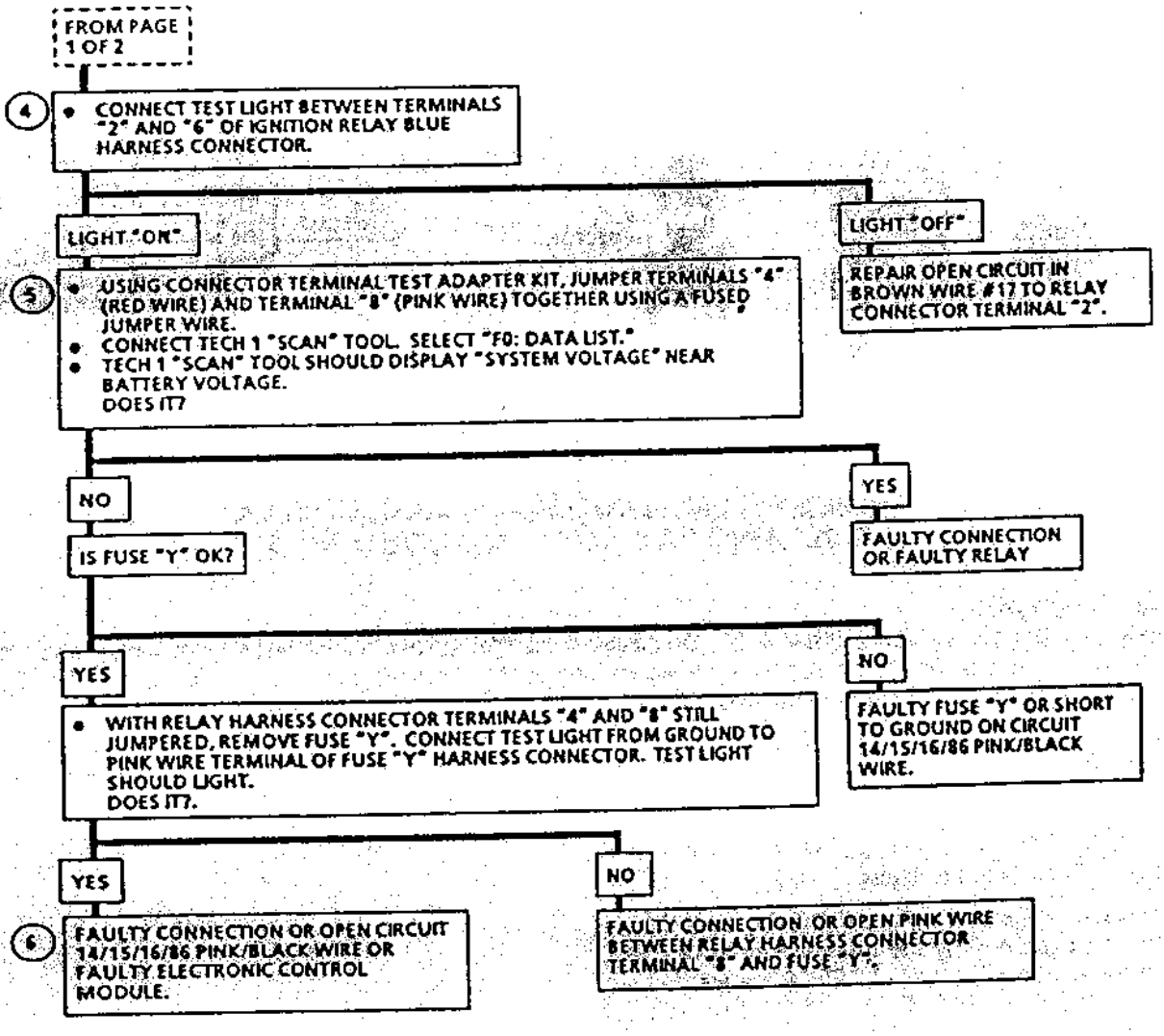
CHART A-4

(Page 2 of 2)

IGNITION RELAY AND POWER CIRCUITS CHECK 1.7L THROTTLE BODY INJECTION NIVA


FROM PAGE 1 OF 2
4
• CONNECT TEST LIGHT BETWEEN TERMINALS "2" AND "6" OF IGNITION RELAY BLUE HARNESS CONNECTOR.
LIGHT "ON"
LIGHT "OFF"
REPAIR OPEN CIRCUIT IN BROWN WIRE #17 TO RELAY CONNECTOR TERMINAL "2".
5
• USING CONNECTOR TERMINAL TEST ADAPTER KIT, JUMPER TERMINALS "4" (RED WIRE) AND TERMINAL "8" (PINK WIRE) TOGETHER USING A FUSED JUMPER WIRE.
• CONNECT TECH 1 "SCAN" TOOL. SELECT "F0: DATA LIST."
• TECH 1 "SCAN" TOOL SHOULD DISPLAY "SYSTEM VOLTAGE" NEAR BATTERY VOLTAGE.
DOES IT?
NO
YES
IS FUSE "Y" OK?
FAULTY CONNECTION OR FAULTY RELAY
YES
NO
• WITH RELAY HARNESS CONNECTOR TERMINALS "4" AND "8" STILL JUMPERED, REMOVE FUSE "Y". CONNECT TEST LIGHT FROM GROUND TO PINK WIRE TERMINAL OF FUSE "Y" HARNESS CONNECTOR. TEST LIGHT SHOULD LIGHT.
DOES IT?.
FAULTY FUSE "Y" OR SHORT TO GROUND ON CIRCUIT 14/15/16/86 PINK/BLACK WIRE.
YES
NO
6
FAULTY CONNECTION OR OPEN CIRCUIT 14/15/16/86 PINK/BLACK WIRE OR FAULTY ELECTRONIC CONTROL MODULE.
FAULTY CONNECTION OR OPEN PINK WIRE BETWEEN RELAY HARNESS CONNECTOR TERMINAL "8" AND FUSE "Y".

9-21-92
NS 15210

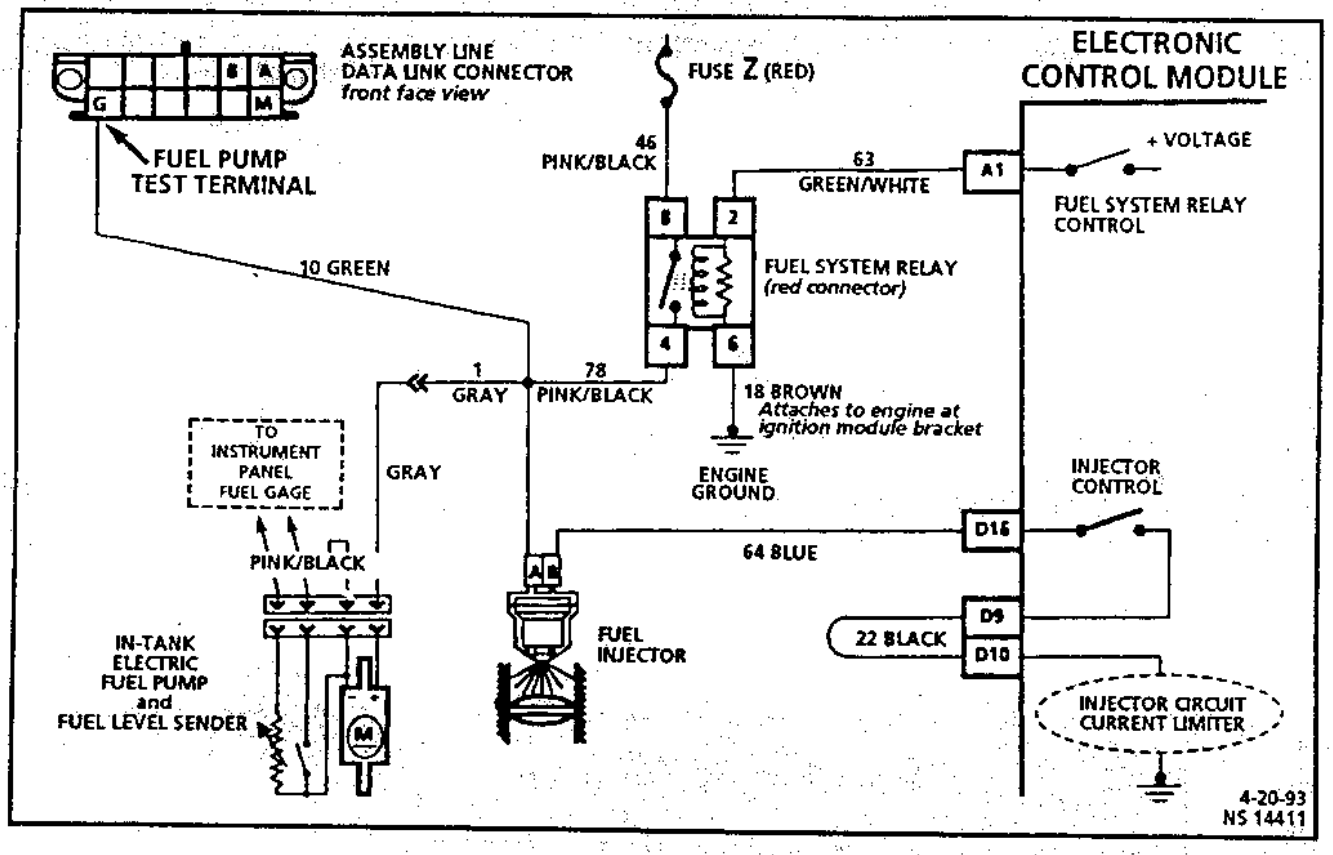


CHART A-5

FUEL SYSTEM ELECTRICAL CIRCUIT CHECK
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

When the ignition switch is turned "ON," the electronic control module will activate the fuel pump relay and run the in-tank fuel pump. The fuel pump will operate as long as the engine is cranking or running, and the electronic control module is receiving ignition reference pulses.

If there are no reference pulses, the electronic control module will shut "OFF" the fuel pump within 2 seconds after ignition "ON."

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The fuel system relay as described above can be energized by turning the ignition key to the "ON" position, after it has been "OFF" for at least 15 seconds. The fuel pump should run for 2 seconds and then turn "OFF" as described above. To reenergize the pump turn the key to the "OFF" position for 10 seconds, then turn it to the "ON" position again.

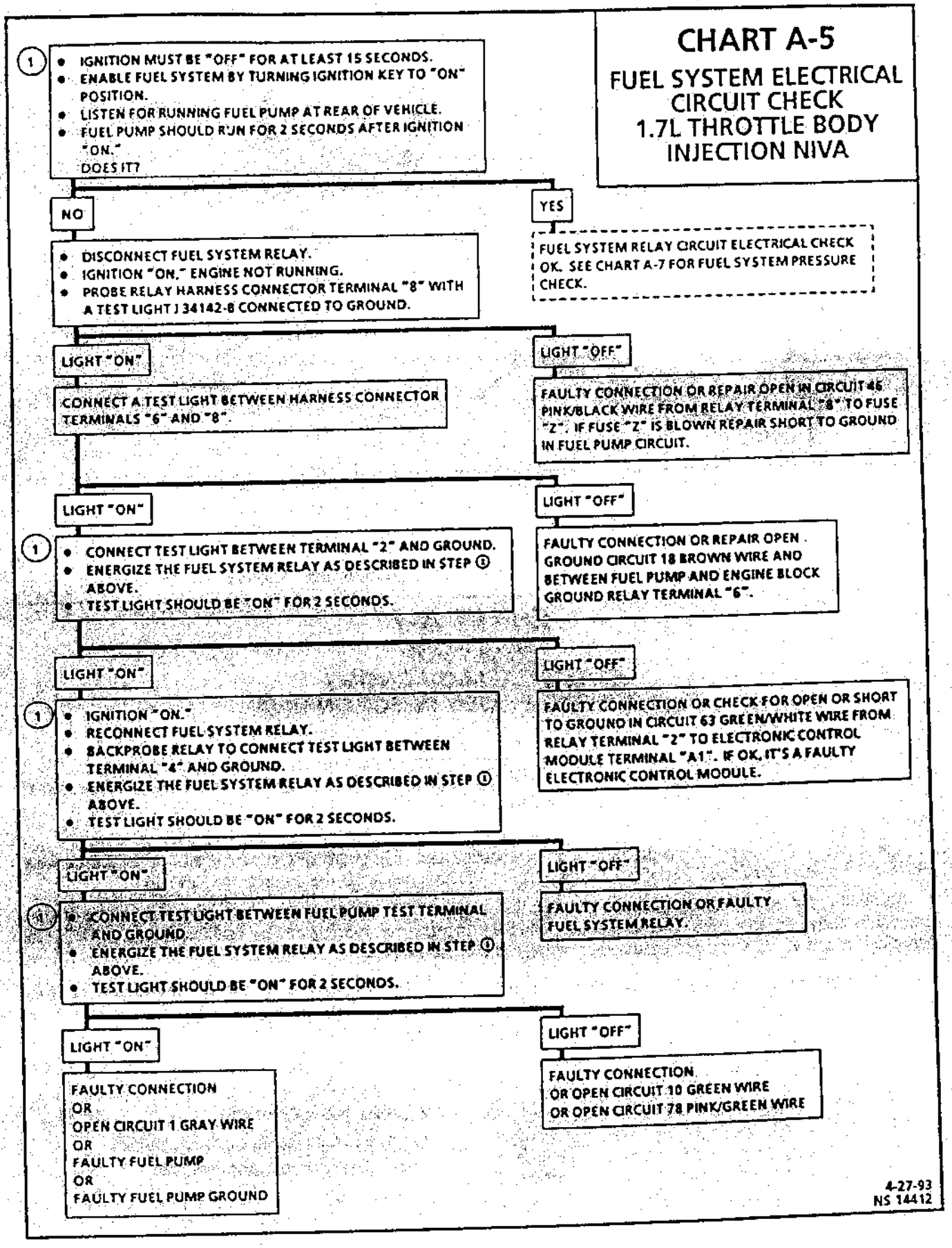
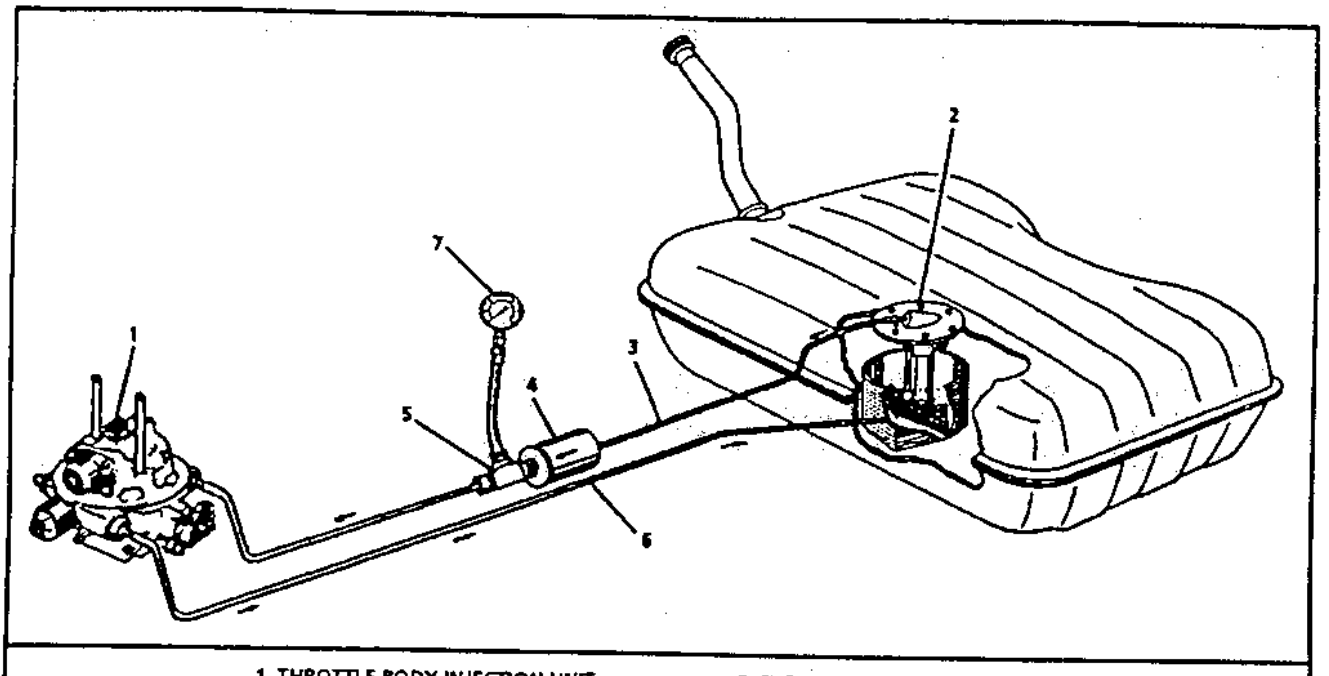


CHART A-5
FUEL SYSTEM ELECTRICAL CIRCUIT CHECK 1.7L THROTTLE BODY INJECTION NIVA
1
• IGNITION MUST BE "OFF" FOR AT LEAST 15 SECONDS.
• ENABLE FUEL SYSTEM BY TURNING IGNITION KEY TO "ON" POSITION.
• LISTEN FOR RUNNING FUEL PUMP AT REAR OF VEHICLE.
• FUEL PUMP SHOULD RUN FOR 2 SECONDS AFTER IGNITION "ON."
DOES IT?
NO
YES
FUEL SYSTEM RELAY CIRCUIT ELECTRICAL CHECK OK. SEE CHART A-7 FOR FUEL SYSTEM PRESSURE CHECK.
• DISCONNECT FUEL SYSTEM RELAY.
• IGNITION "ON," ENGINE NOT RUNNING.
• PROBE RELAY HARNESS CONNECTOR TERMINAL "8" WITH A TEST LIGHT J 34142-B CONNECTED TO GROUND.
LIGHT "ON"
LIGHT "OFF"
CONNECT A TEST LIGHT BETWEEN HARNESS CONNECTOR TERMINALS "6" AND "8".
FAULTY CONNECTION OR REPAIR OPEN IN CIRCUIT 46 PINK/BLACK WIRE FROM RELAY TERMINAL "8" TO FUSE "Z". IF FUSE "Z" IS BLOWN REPAIR SHORT TO GROUND IN FUEL PUMP CIRCUIT.
LIGHT "ON"
LIGHT "OFF"
1
• CONNECT TEST LIGHT BETWEEN TERMINAL "2" AND GROUND.
• ENERGIZE THE FUEL SYSTEM RELAY AS DESCRIBED IN STEP ① ABOVE.
• TEST LIGHT SHOULD BE "ON" FOR 2 SECONDS.
FAULTY CONNECTION OR REPAIR OPEN GROUND CIRCUIT 18 BROWN WIRE AND BETWEEN FUEL PUMP AND ENGINE BLOCK GROUND RELAY TERMINAL "6".
LIGHT "ON"
LIGHT "OFF"
1
• IGNITION "ON."
• RECONNECT FUEL SYSTEM RELAY.
• BACKPROBE RELAY TO CONNECT TEST LIGHT BETWEEN TERMINAL "4" AND GROUND.
• ENERGIZE THE FUEL SYSTEM RELAY AS DESCRIBED IN STEP ① ABOVE.
• TEST LIGHT SHOULD BE "ON" FOR 2 SECONDS.
FAULTY CONNECTION OR CHECK FOR OPEN OR SHORT TO GROUND IN CIRCUIT 63 GREEN/WHITE WIRE FROM RELAY TERMINAL "2" TO ELECTRONIC CONTROL MODULE TERMINAL "A1". IF OK, IT'S A FAULTY ELECTRONIC CONTROL MODULE.
LIGHT "ON"
LIGHT "OFF"
1
• CONNECT TEST LIGHT BETWEEN FUEL PUMP TEST TERMINAL AND GROUND.
• ENERGIZE THE FUEL SYSTEM RELAY AS DESCRIBED IN STEP ① ABOVE.
• TEST LIGHT SHOULD BE "ON" FOR 2 SECONDS.
FAULTY CONNECTION OR FAULTY FUEL SYSTEM RELAY.
LIGHT "ON"
LIGHT "OFF"
FAULTY CONNECTION
OR
OPEN CIRCUIT 1 GRAY WIRE
OR
FAULTY FUEL PUMP
OR
FAULTY FUEL PUMP GROUND
FAULTY CONNECTION
OR OPEN CIRCUIT 10 GREEN WIRE
OR OPEN CIRCUIT 78 PINK/GREEN WIRE
4-27-93
NS 14412



1 THROTTLE BODY INJECTION UNIT
2 FUEL PUMP
3 FUEL SUPPLY PRESSURE LINE
4 FUEL FILTER
5 FUEL PRESSURE TEST FITTING (PART OF TOOL J 38970-V)
6 FUEL RETURN LINE
7 FUEL PRESSURE GAUGE (PART OF TOOL J 28970-V)

NS 14683

CHART A-7

(Page 1 of 2)

FUEL SYSTEM DIAGNOSIS 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

When the ignition switch is turned "ON," the electronic control module will turn "ON" the fuel pump. It will remain "ON" as long as the engine is cranking or running, and the electronic control module is receiving crankshaft position pulses. If there are no reference pulses, the electronic control module will shut "OFF" the fuel pump within 2 seconds after key "ON."

The pump will deliver fuel to the throttle body injection unit, where the system pressure is controlled between 190 kPa (27.6 psi, 1.9 bar) and 210 kPa (30.5 psi, 2.1 bar). Excess fuel is then returned to the fuel tank.

The fuel pump test terminal (assembly line data link terminal "G") is located above and to the right of the driver's kick panel, above the electronic control module. When the engine is not running and the ignition switch is "OFF," the pump can be turned "ON" by applying battery voltage to the test terminal.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Checks for proper fuel pressure and system operation. By turning the ignition key to the "ON" position you will be able to energize the fuel system for 2 seconds at a time.
2. This step checks for leaks or loose connections between the fuel pressure test fitting and the throttle body injection unit. This step will also determine if the pressure regulator is operating properly.
3. This portion ensures no leaks or loose connections are present between the fuel pump and the fuel pressure test fitting. This step will also determine if the fuel pump is operating properly.

Diagnostic Aids:

Improper fuel system pressure can result in one of the following symptoms:

- Cranks, but will not run.
- Cuts out, may feel like ignition problem.
- Poor fuel economy, loss of power.
- Hesitation.

Have an assistant listen for fuel pump at rear of vehicle, pump may not be audible inside vehicle.

CHART A-7

(Page 1 of 2)

FUEL SYSTEM DIAGNOSIS 1.7L THROTTLE BODY INJECTION NIVA

1

- FUEL TANK HAS SUFFICIENT FUEL AND FUEL QUALITY IS OK.
- IGNITION "OFF," REMOVE FUEL TANK FILLER CAP TO RELIEVE ANY RESIDUAL TANK PRESSURE.
- DISCONNECT 4-TERMINAL ELECTRICAL CONNECTOR AT FUEL PUMP. (CONNECTOR ACCESS PANEL IS LOCATED IN FLOOR PAN DIRECTLY ABOVE FUEL TANK.)
- START ENGINE AND IDLE UNTIL ENGINE STALLS. ENGAGE STARTER FOR 3 SECONDS TO RELIEVE ANY REMAINING PRESSURE.
- DISCONNECT FUEL SUPPLY PRESSURE PIPE FROM FUEL FILTER "OUTLET" FITTING. INSTALL FUEL PRESSURE TEST FITTING TOOL J 38970-V BETWEEN FUEL FILTER OUTLET FITTING AND FUEL PIPE. (SEE FACING PAGE ILLUSTRATION.)
- INSTALL PRESSURE GAUGE J 38970-V ONTO FUEL PRESSURE TEST FITTING.
- IGNITION "OFF" FOR AT LEAST 15 SECONDS.
- OBSERVE FUEL PRESSURE AS IGNITION IS TURNED TO THE "ON" POSITION. THIS WILL CAUSE THE FUEL SYSTEM RELAY TO TURN "ON" FOR 2 SECONDS, THEN "OFF." DURING THE 2 SECONDS OF "ON" TIME THE FUEL PRESSURE SHOULD BE BETWEEN 190 kPa (27.6 psi, 1.9 bar) AND 210 kPa (30 psi, 2.1 bar).

IS IT?

YES

NO → GO TO CHART A-7 PAGE 2 OF 2.

2

AFTER PUMP STOPS RUNNING, PRESSURE MAY DECREASE SLIGHTLY, THEN SHOULD HOLD STEADY WITH NO FURTHER DROP IN PRESSURE. (IF ENGINE IS WARM, A SLOW GRADUAL INCREASE IN PRESSURE IS NORMAL.) WHAT DOES PRESSURE DO?

PRESSURE HOLDS → NO TROUBLE FOUND

PRESSURE CONTINUES TO DROP

- IGNITION "OFF" FOR AT LEAST 15 SECONDS.
- AGAIN TURN THE IGNITION KEY "ON" TO ENERGIZE FUEL PUMP. IMMEDIATELY AFTER PUMP STOPS RUNNING, PINCH COMPLETELY SHUT A RUBBER SECTION OF FUEL HOSE BETWEEN FUEL PRESSURE TEST FITTING AND THROTTLE BODY INJECTION UNIT.

DOES FUEL PRESSURE STABILIZE AND STOP DROPPING?

YES

- CHECK FOR LEAKS OR LOOSE CONNECTIONS BETWEEN THE FUEL PRESSURE TEST FITTING AND THE THROTTLE BODY INJECTION UNIT. MAKE THE SAME CHECK BETWEEN THE THROTTLE BODY INJECTION UNIT AND THE FUEL TANK.
- IF NO PROBLEMS ARE FOUND, REPLACE FUEL PRESSURE REGULATOR ON THE THROTTLE BODY INJECTION UNIT.

NO

3

- IGNITION "OFF" FOR AT LEAST 15 SECONDS.
- AGAIN TURN THE IGNITION KEY "ON" TO ENERGIZE FUEL PUMP. IMMEDIATELY AFTER PUMP STOPS RUNNING, PINCH COMPLETELY SHUT A RUBBER SECTION OF FUEL HOSE BETWEEN FUEL PRESSURE TEST FITTING AND FUEL TANK. FUEL PRESSURE SHOULD STABILIZE AND STOP DROPPING.

DOES IT?

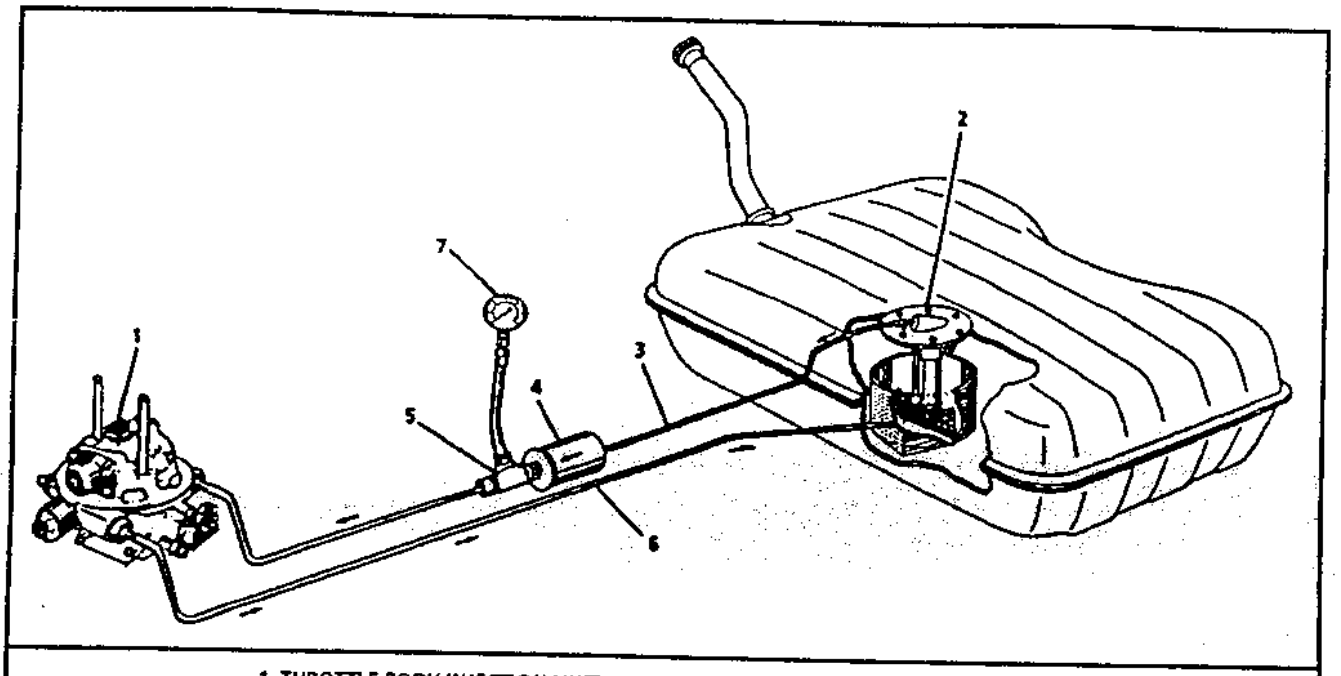
YES

- CHECK FOR LEAKS OR LOOSE CONNECTIONS BETWEEN THE FUEL TANK AND THE FUEL PRESSURE TEST FITTING (THE SUPPLY LINE INCLUDING FUEL FILTER).
- IF NO PROBLEMS ARE FOUND REPLACE FUEL PUMP.

NO

- GO THROUGH STEP 2, AGAIN MAKING SURE THERE ARE NO LEAKS OR LOOSE CONNECTIONS AS SPECIFIED ABOVE.

4-27-93
NS 14413



1 THROTTLE BODY INJECTION UNIT
2 FUEL PUMP
3 FUEL SUPPLY PRESSURE LINE
4 FUEL FILTER
5 FUEL PRESSURE TEST FITTING (PART OF TOOL J 38970-V)
6 FUEL RETURN LINE
7 FUEL PRESSURE GAUGE (PART OF TOOL J 28970-V)

NS 14683

CHART A-7

(Page 2 of 2)
FUEL SYSTEM DIAGNOSIS
1.7L THROTTLE BODY INJECTION NIVA

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

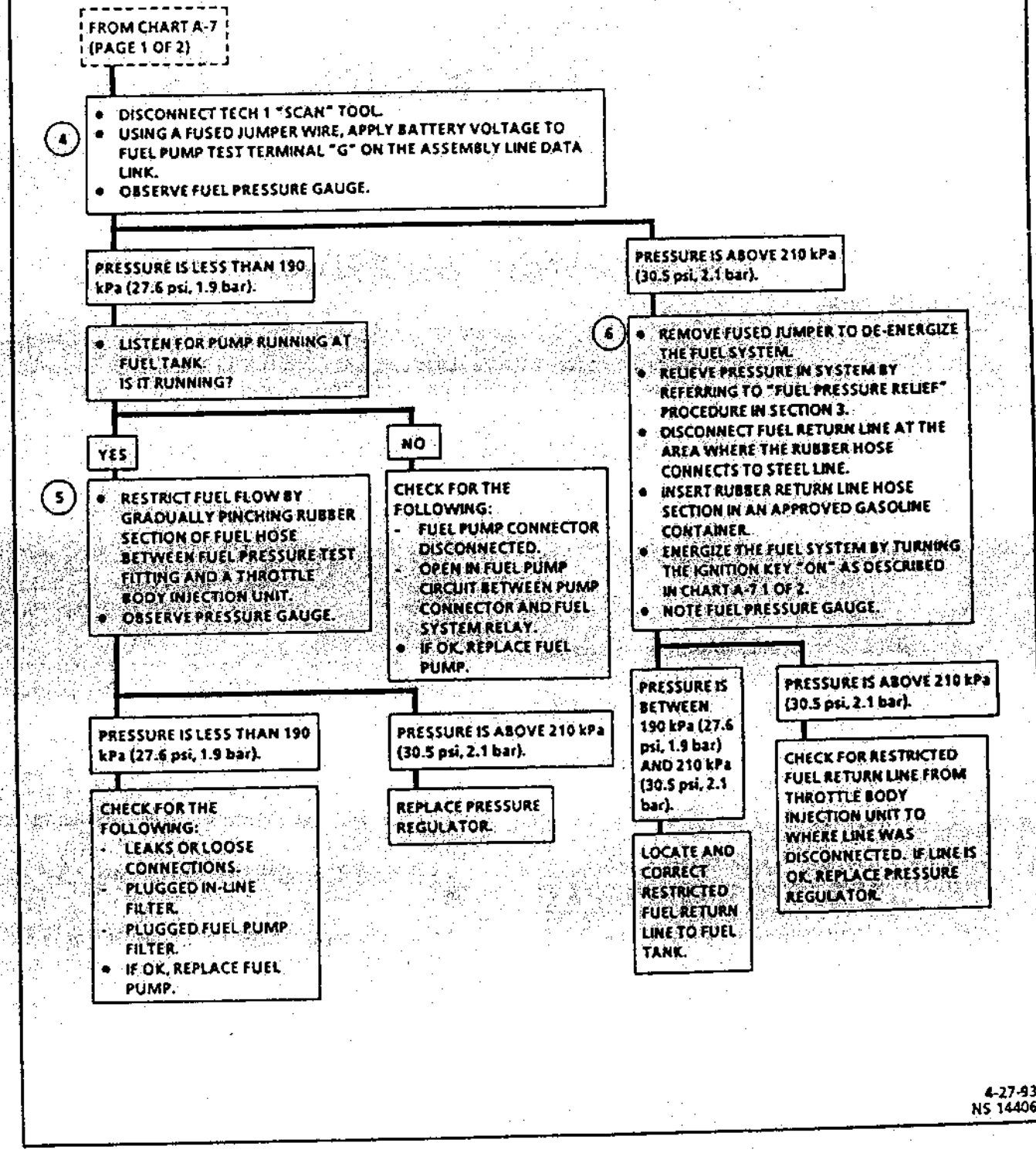
4. Fuel pressure less than 190 kPa (27.6 psi, 1.9 bar) falls into two areas:
   - Amount of fuel to injector is OK, but the pressure is less than 190 kPa (27.6 psi, 1.9 bar). Low fuel pressure can cause poor overall performance.
   - Restricted flow causing pressure drop. Normally, a vehicle with a fuel pressure of less than 190 kPa (27.6 psi, 1.9 bar) at idle will not be driveable. However, if the pressure drop occurs only while driving, the engine will surge, then stop, as pressure begins to drop rapidly.
5. Turning the fuel pump "ON" and restricting fuel flow at the fuel pressure gage will determine if the fuel pump can supply enough fuel pressure to the injector to operate properly, above 190 kPa (27.6 psi, 1.9 bar).

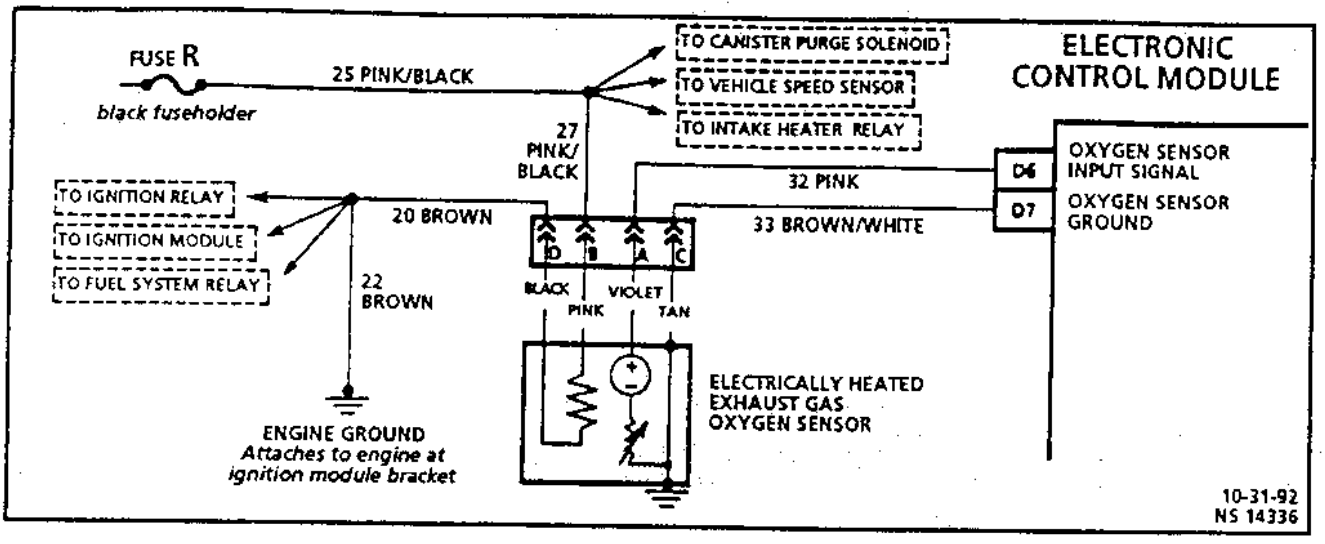
   NOTICE: Do not restrict the fuel return line, this may damage the fuel pressure regulator.
6. This test determines if the high fuel pressure is due to a restricted fuel return line, or a throttle body pressure regulator problem. Apply battery voltage to the fuel pump test connector only long enough to get an accurate fuel pressure reading.

CHART A-7

(Page 2 of 2)

FUEL SYSTEM DIAGNOSIS 1.7L THROTTLE BODY INJECTION NIVA


FROM CHART A-7 (PAGE 1 OF 2)
4
• DISCONNECT TECH 1 "SCAN" TOOL.
• USING A FUSED JUMPER WIRE, APPLY BATTERY VOLTAGE TO FUEL PUMP TEST TERMINAL "G" ON THE ASSEMBLY LINE DATA LINK.
• OBSERVE FUEL PRESSURE GAUGE.
PRESSURE IS LESS THAN 190 kPa (27.6 psi, 1.9 bar).
• LISTEN FOR PUMP RUNNING AT FUEL TANK. IS IT RUNNING?
YES
NO
5
• RESTRICT FUEL FLOW BY GRADUALLY PINCHING RUBBER SECTION OF FUEL HOSE BETWEEN FUEL PRESSURE TEST FITTING AND A THROTTLE BODY INJECTION UNIT.
• OBSERVE PRESSURE GAUGE.
CHECK FOR THE FOLLOWING:
- FUEL PUMP CONNECTOR DISCONNECTED.
- OPEN IN FUEL PUMP CIRCUIT BETWEEN PUMP CONNECTOR AND FUEL SYSTEM RELAY.
• IF OK, REPLACE FUEL PUMP.
PRESSURE IS LESS THAN 190 kPa (27.6 psi, 1.9 bar).
CHECK FOR THE FOLLOWING:
- LEAKS OR LOOSE CONNECTIONS.
- PLUGGED IN-LINE FILTER.
- PLUGGED FUEL PUMP FILTER.
• IF OK, REPLACE FUEL PUMP.
PRESSURE IS ABOVE 210 kPa (30.5 psi, 2.1 bar).
REPLACE PRESSURE REGULATOR.
PRESSURE IS ABOVE 210 kPa (30.5 psi, 2.1 bar).
6
• REMOVE FUSED JUMPER TO DE-ENERGIZE THE FUEL SYSTEM.
• RELIEVE PRESSURE IN SYSTEM BY REFERRING TO "FUEL PRESSURE RELIEF" PROCEDURE IN SECTION 3.
• DISCONNECT FUEL RETURN LINE AT THE AREA WHERE THE RUBBER HOSE CONNECTS TO STEEL LINE.
• INSERT RUBBER RETURN LINE HOSE SECTION IN AN APPROVED GASOLINE CONTAINER.
• ENERGIZE THE FUEL SYSTEM BY TURNING THE IGNITION KEY "ON" AS DESCRIBED IN CHART A-7 1 OF 2.
• NOTE FUEL PRESSURE GAUGE.
PRESSURE IS BETWEEN 190 kPa (27.6 psi, 1.9 bar) AND 210 kPa (30.5 psi, 2.1 bar).
LOCATE AND CORRECT RESTRICTED FUEL RETURN LINE TO FUEL TANK.
PRESSURE IS ABOVE 210 kPa (30.5 psi, 2.1 bar).
CHECK FOR RESTRICTED FUEL RETURN LINE FROM THROTTLE BODY INJECTION UNIT TO WHERE LINE WAS DISCONNECTED. IF LINE IS OK, REPLACE PRESSURE REGULATOR.
4-27-93
NS 14406



CODE 13

NO OXYGEN SENSOR SIGNAL 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The electronic control module applies a reference voltage of approximately 450 millivolts between terminals "D7" and "D6". The oxygen sensor varies the voltage within a range of about 1 volt if the exhaust is rich, and down through about 10 millivolt if exhaust is lean. Code 13 is set when the voltage does not vary on Circuit 32 within a predetermined amount of time.

The sensor is like an open circuit and produces no voltage when it is below 315°C. An open sensor circuit, or a cold sensor causes "Open Loop" operation.

The heater circuit of the oxygen sensor is turned "ON" by the ignition relay when the engine is running.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 13 will set:
   - Engine has been running longer than 40 seconds.
   - Engine coolant temperature greater than 77°C.
   - Throttle position sensor signal above 6% (about 0.3 volt above closed throttle voltage).
   - Oxygen sensor signal voltage steady between 350 and 550 millivolts for 3 seconds.

   If the conditions for a Code 13 exist, the system will not go into "Closed Loop."
2. This test checks the oxygen sensor's heating element. The heating element resistance should be 3.5 ohms at 20°C or 13.2 ohms at 595°C. At room temperature (20°C) the heater resistance should be 3.5–4.5Ω, normally it should be about 3.8Ω.
3. This will determine if the sensor is at fault.
4. For this test use only a high impedance digital voltmeter. This test checks the continuity of Circuit 32 Pink wire and Circuit 33 Brown/White wire. If Circuit 33 Brown/White wire is open, the electronic control module voltage on Circuit 32 Pink wire will be over 600 mV.
5. If the air conditioning fuse was open, check the air conditioning fuse circuits or generator circuits for shorts.

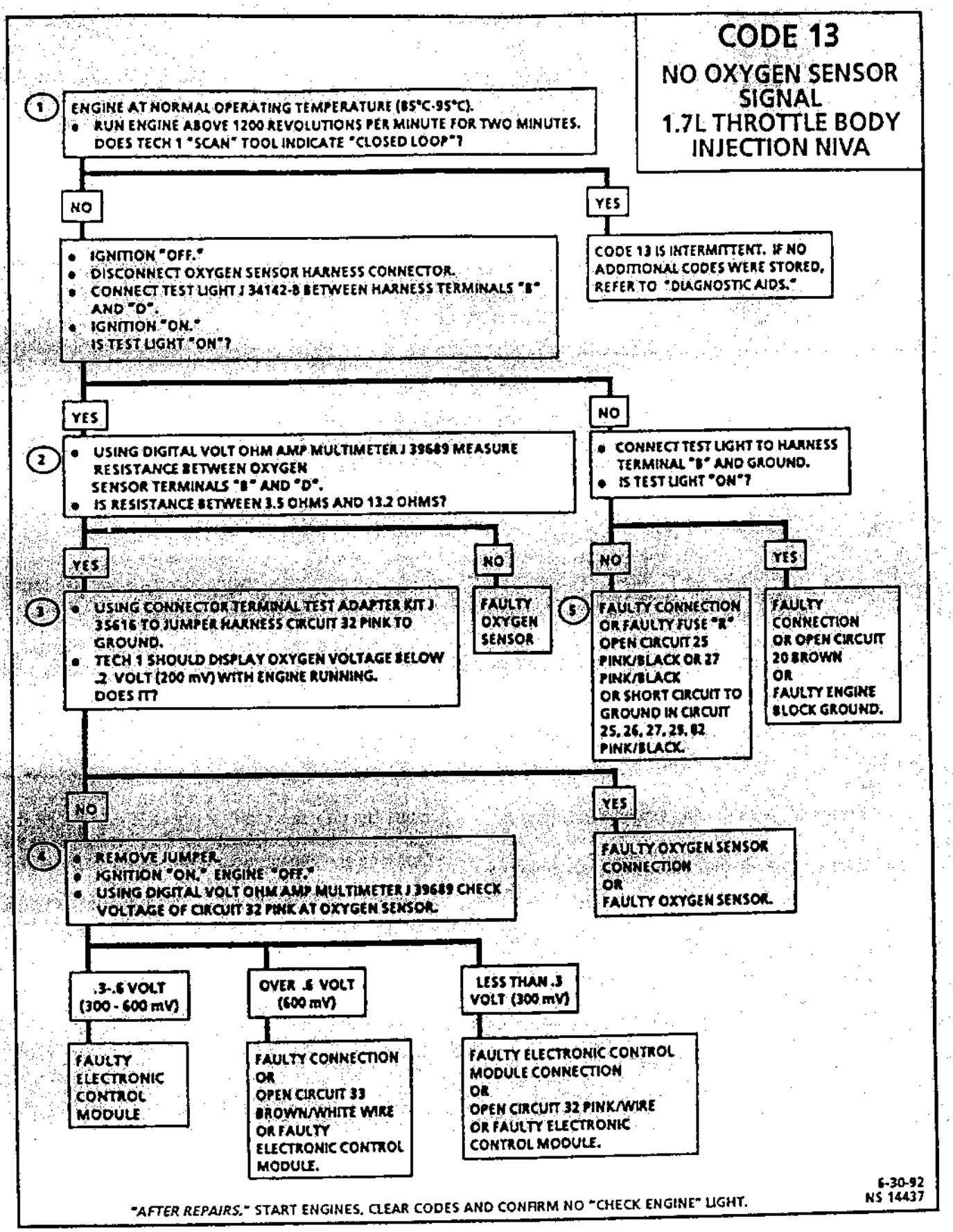
Diagnostic Aids:

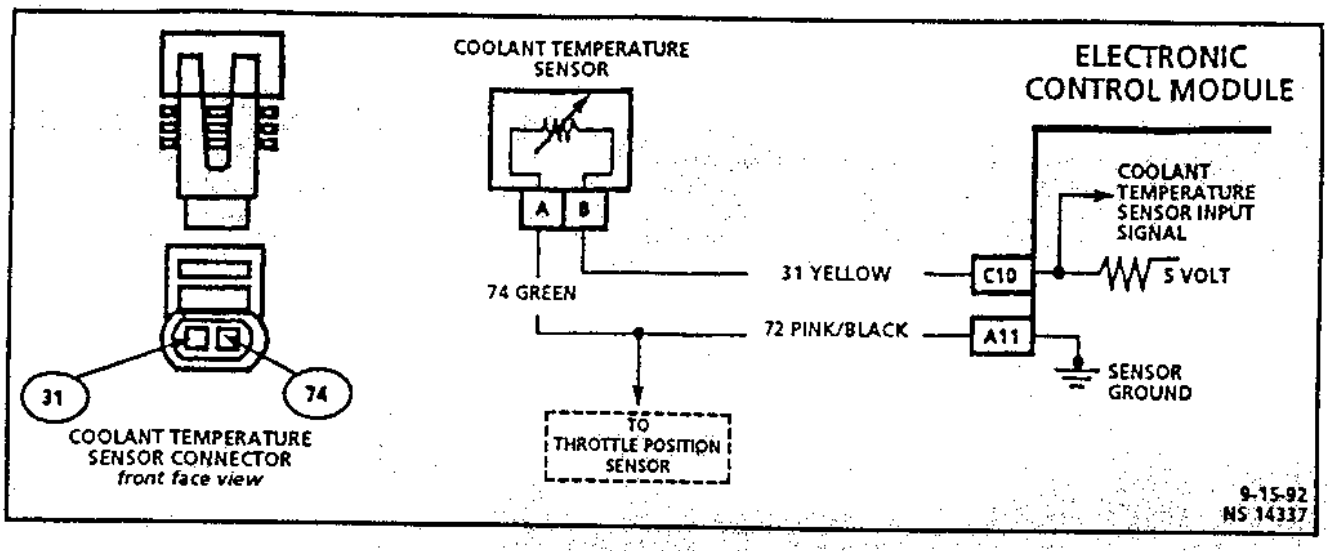
If the oxygen sensor heaters are not operating properly, system may go into "Open Loop" after extended idle.

Normal voltage varies between 10 mV to 1000 mV (.01 and 1.0 volt), while in "Closed Loop," Code 13 sets in one minute if voltage remains between 350 and 550 millivolt, however, the system will go "Open Loop" in about 15 seconds.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

An oxygen supply inside the oxygen sensor is necessary for proper oxygen sensor operation. This supply of oxygen is supplied through the oxygen sensor wires. All oxygen sensor wires and connections should be inspected for breaks or contamination that could prevent reference oxygen from reaching the oxygen sensor.


CODE 13
NO OXYGEN SENSOR SIGNAL
1.7L THROTTLE BODY INJECTION NIVA
1
ENGINE AT NORMAL OPERATING TEMPERATURE (85°C-95°C).
• RUN ENGINE ABOVE 1200 REVOLUTIONS PER MINUTE FOR TWO MINUTES.
DOES TECH 1 "SCAN" TOOL INDICATE "CLOSED LOOP"?
NO
YES
CODE 13 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS."
• IGNITION "OFF."
• DISCONNECT OXYGEN SENSOR HARNESS CONNECTOR.
• CONNECT TEST LIGHT J 34142-B BETWEEN HARNESS TERMINALS "B" AND "D".
• IGNITION "ON."
IS TEST LIGHT "ON"?
YES
NO
2
• USING DIGITAL VOLT OHM AMP MULTIMETER J 39689 MEASURE RESISTANCE BETWEEN OXYGEN SENSOR TERMINALS "B" AND "D".
• IS RESISTANCE BETWEEN 3.5 OHMS AND 13.2 OHMS?
• CONNECT TEST LIGHT TO HARNESS TERMINAL "B" AND GROUND.
• IS TEST LIGHT "ON"?
YES
NO
NO
YES
3
• USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER HARNESS CIRCUIT 32 PINK TO GROUND.
• TECH 1 SHOULD DISPLAY OXYGEN VOLTAGE BELOW .2 VOLT (200 mV) WITH ENGINE RUNNING.
DOES IT?
FAULTY OXYGEN SENSOR
5
FAULTY CONNECTION OR FAULTY FUSE "R" OPEN CIRCUIT 25 PINK/BLACK OR 27 PINK/BLACK OR SHORT CIRCUIT TO GROUND IN CIRCUIT 25, 26, 27, 29, 82 PINK/BLACK.
FAULTY CONNECTION OR OPEN CIRCUIT 20 BROWN OR FAULTY ENGINE BLOCK GROUND.
NO
YES
4
• REMOVE JUMPER.
• IGNITION "ON," ENGINE "OFF."
• USING DIGITAL VOLT OHM AMP MULTIMETER J 39689 CHECK VOLTAGE OF CIRCUIT 32 PINK AT OXYGEN SENSOR.
FAULTY OXYGEN SENSOR CONNECTION OR FAULTY OXYGEN SENSOR.
.3-.6 VOLT (300 - 600 mV)
OVER .6 VOLT (600 mV)
LESS THAN .3 VOLT (300 mV)
FAULTY ELECTRONIC CONTROL MODULE
FAULTY CONNECTION OR OPEN CIRCUIT 33 BROWN/WHITE WIRE OR FAULTY ELECTRONIC CONTROL MODULE.
FAULTY ELECTRONIC CONTROL MODULE CONNECTION OR OPEN CIRCUIT 32 PINK/WIRE OR FAULTY ELECTRONIC CONTROL MODULE.
6-30-92
NS 14437
"AFTER REPAIRS," START ENGINES, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.



CODE 14

COOLANT TEMPERATURE (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The coolant temperature sensor is a thermistor that controls the signal voltage to the electronic control module. The electronic control module applies about 5 volts on the Yellow wire from electronic control module terminal "C10" to the coolant temperature sensor, and "looks" at the voltage drop. When the engine coolant is cold the sensor (thermistor) resistance is high, therefore the electronic control module will "see" high signal voltage.

As the engine warms, the coolant sensor (thermistor) resistance becomes less, and the electronic control module sees a lower signal voltage. At normal engine operating temperature (85°C–95°C) the voltage will measure about 1.5 to 2.0 volts.

Test Description:

Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 14 will set if:
   - Engine has been running longer than 2 seconds.

   AND
   - Coolant temperature sensor input signal voltage indicates engine coolant temperature is above 135°C.
2. This test determines if the Circuit 31 Yellow wire from the coolant temperature sensor to electronic control module terminal "C10" is shorted to ground (low volts/resistance) which will set a Code 14.

Diagnostic Aids:

The Tech 1 "Scan" tool displays engine temperature in degrees Celsius. After the engine is started, the temperature should rise steadily to about 85–95°C then stabilize when the thermostat opens. Check terminals at the sensor for a good connection.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

CODE 14

COOLANT TEMPERATURE (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

1. • IGNITION "ON," ENGINE NOT RUNNING.
   • CONNECT TECH 1.
   • SELECT "F8: DATA LIST."
   DOES TECH 1 DISPLAY COOLANT TEMPERATURE OF 130°C OR HIGHER?

YES

2. • DISCONNECT COOLANT TEMPERATURE SENSOR.
   • TECH 1 SHOULD DISPLAY COOLANT TEMPERATURE BELOW -30°C.
   DOES IT?

YES

REPLACE COOLANT TEMPERATURE SENSOR.

NO

CODE 14 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

NO

CIRCUIT 31 YELLOW WIRE FROM THE COOLANT TEMPERATURE SENSOR TO ELECTRONIC CONTROL MODULE TERMINAL "C10" IS SHORTED TO GROUND
OR
CIRCUIT 31 YELLOW WIRE FROM THE COOLANT TEMPERATURE SENSOR TO ELECTRONIC CONTROL MODULE TERMINAL "C10" IS SHORTED TO COOLANT TEMPERATURE SENSOR AND THROTTLE POSITION SENSOR GROUND CIRCUIT, CIRCUIT 72 PINK/BLACK OR CIRCUIT 74 GREEN WIRE FROM THE COOLANT TEMPERATURE SENSOR AND THROTTLE POSITION SENSOR TO ELECTRONIC CONTROL MODULE TERMINAL "A11"
OR FAULTY ELECTRONIC CONTROL MODULE.

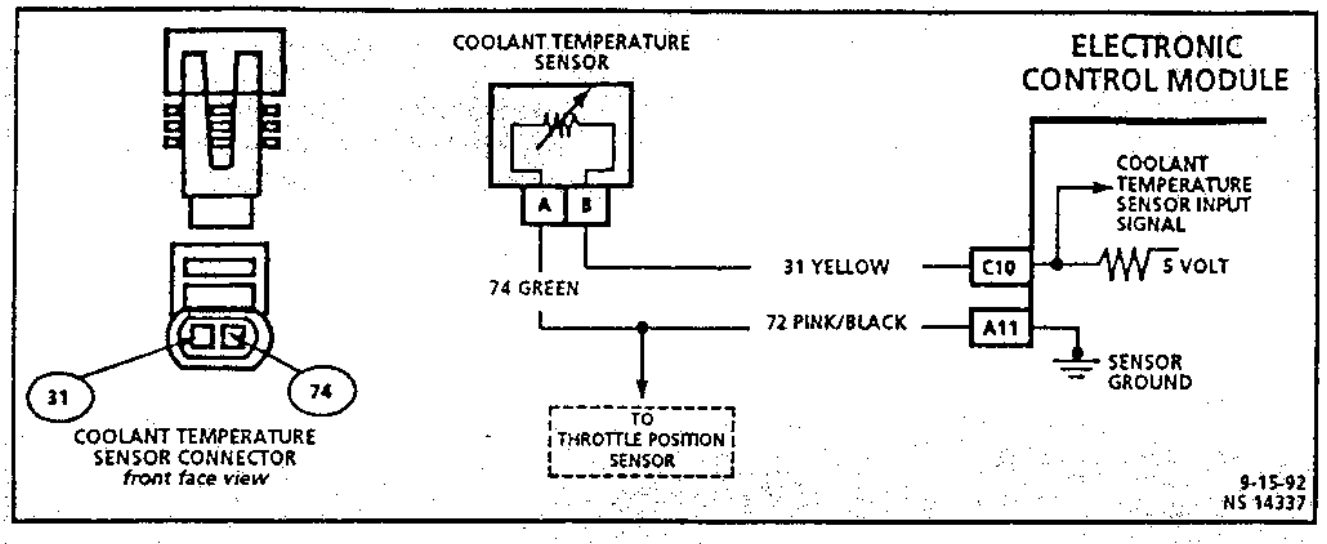
DIAGNOSTIC AID

COOLANT TEMPERATURE SENSOR
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	OHMS
100	177
90	241
80	332
70	467
60	667
50	973
45	1188
40	1459
35	1802
30	2238
25	2796
20	3520
15	4450
10	5670
5	7280
0	9420
-5	12300
-10	16180
-15	21450
-20	28680
-30	52700
-40	100700

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-27-92
NS 14338



CODE 15

COOLANT TEMPERATURE (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The coolant temperature sensor is a thermistor that controls the signal voltage to the electronic control module. The electronic control module applies about 5 volts on Circuit 31 Yellow wire from the electronic control module terminal "C10" to the coolant temperature sensor, and "looks" at the voltage drop. When the engine coolant is cold the sensor (thermistor) resistance is high, therefore the electronic control module will "see" high signal voltage.

As the engine warms, the coolant sensor (thermistor) resistance becomes less, and the electronic control module sees a lower signal voltage. At normal engine operating temperature (85°C–95°C) the voltage will measure about 1.5 to 2.0 volts.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 15 will set if:
   - Engine has been running longer than 58 seconds.
     AND
   - Coolant temperature sensor signal voltage indicates engine coolant temperature less than -37°C.
2. This test simulates a Code 14 - coolant temperature sensor (high temperature - low voltage/resistance indicated). If the electronic control module receives the low voltage/resistance signal (high temperature), and the Tech 1 "Scan" tool displays 130°C or above, the electronic control module and the coolant temperature sensor circuits are OK.
3. This tests for an open in the Circuit 31 Yellow wire from the coolant temperature sensor to electronic control module terminal "C10". When the Circuit 31 Yellow wire is jumpered/shorted to a good ground—the electronic control module should "see" a low resistance/voltage—high temperature on the coolant temperature sensor circuit (electronic control module terminal "C10"). If the Tech 1 displays a high temperature when the Yellow wire is shorted to ground, then the Circuit 31 Yellow wire to electronic control module terminal "C10" and the electronic control module are OK.

   Voltage between the Circuit 31 Yellow wire (coolant temperature sensor to electronic control module terminal "C10") and ground is normally 5 volts (the coolant temperature sensor connector disconnected and not jumpered/shorted to ground).

Diagnostic Aids:

The Tech 1 "Scan" tool reads engine coolant temperature in degrees Celsius. After the engine is started, the temperature should rise steadily to about 85-95°C, then stabilize when the thermostat opens.

If Code 21 - throttle position sensor is also set, check coolant temperature sensor and throttle position sensor ground circuit (Circuit 74 Green wire Circuit 72 Pink/Black wire) for faulty wiring or connections. Check terminals at sensor for a good connection.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

CODE 15

COOLANT TEMPERATURE (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA

1
- IGNITION "ON," ENGINE RUNNING.
- CONNECT TECH 1.
- SELECT "F0: DATA LIST."

DOES TECH 1 DISPLAY COOLANT TEMPERATURE OF -30°C OR LESS?

YES

2
- DISCONNECT COOLANT TEMPERATURE SENSOR.
- USE CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER HARNESS TERMINALS TOGETHER.
- TECH 1 SHOULD DISPLAY 130°C OR HIGHER.

DOES IT?

NO

3
- REMOVE JUMPER WIRE.
- USE CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER THE CIRCUIT 31 YELLOW WIRE WHICH RUNS FROM THE COOLANT TEMPERATURE SENSOR TO ELECTRONIC CONTROL MODULE TERMINAL "C18" TO A GOOD GROUND.
- TECH 1 SHOULD DISPLAY OVER 130°C.

DOES IT?

YES

OPEN COOLANT TEMPERATURE SENSOR GROUND CIRCUIT (CIRCUIT 72 PINK/BLACK OR CIRCUIT 74 GREEN WIRE FROM THE COOLANT TEMPERATURE SENSOR AND THROTTLE POSITION SENSOR TO ENGINE CONTROL MODULE TERMINAL "A11"). FAULTY CONNECTIONS OR FAULTY ELECTRONIC CONTROL MODULE.

NO

OPEN IN YELLOW WIRE FROM THE COOLANT TEMPERATURE SENSOR TO ELECTRONIC CONTROL MODULE TERMINAL "C18". FAULTY CONNECTION OR FAULTY ELECTRONIC CONTROL MODULE.

NO

CODE 15 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

YES

FAULTY CONNECTION OR FAULTY COOLANT TEMPERATURE SENSOR.

DIAGNOSTIC AID

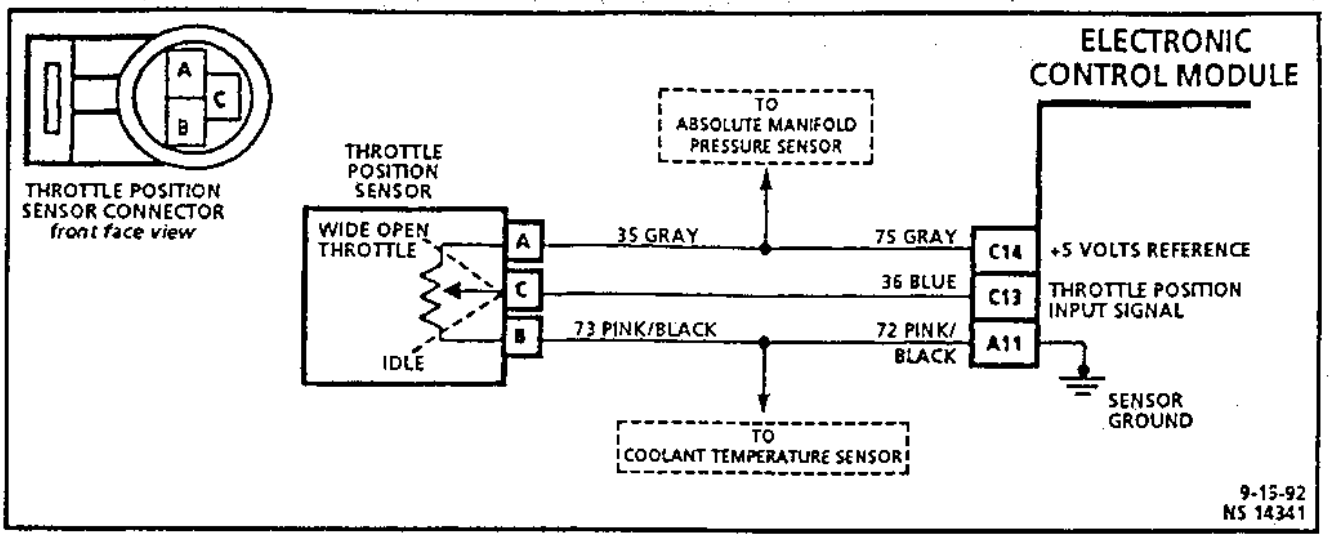
COOLANT TEMPERATURE SENSOR

TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	OHMS
100	177
90	241
80	332
70	467
60	667
50	973
45	1188
40	1459
35	1802
30	2238
25	2796
20	3520
15	4450
10	5670
5	7280
0	9420
-5	12300
-10	16180
-15	21450
-20	28680
-30	52700
-40	100700

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

6-30-92
NS 14340



CODE 21

THROTTLE POSITION (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The throttle position sensor provides a voltage signal that changes relative to the throttle blade. Throttle position sensor signal voltage varies from about 0.25 to 1.25 volts at idle to about 5 volts at wide open throttle.

The throttle position sensor signal is one of the inputs used by the electronic control module for fuel control and for most of the controlled outputs.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 21 will set if:
   - Throttle position sensor signal voltage is greater than 2.56 volts.
   - Manifold absolute pressure is less than 47 kPa.
   - Engine speed is less than or equal to 2000 revolutions per minute.
   - All conditions met for 2 seconds.
2. With the throttle position sensor disconnected, the throttle position sensor signal voltage should go low if the electronic control module and wiring are OK.
3. Probing coolant temperature sensor and throttle position sensor ground circuit (Circuit 72/73 Pink/Black wire from throttle position sensor connector terminal "B" to electronic control module terminal "A11") with a test light to 12 volts checks the sensor ground circuit. A faulty sensor ground can cause a Code 21.

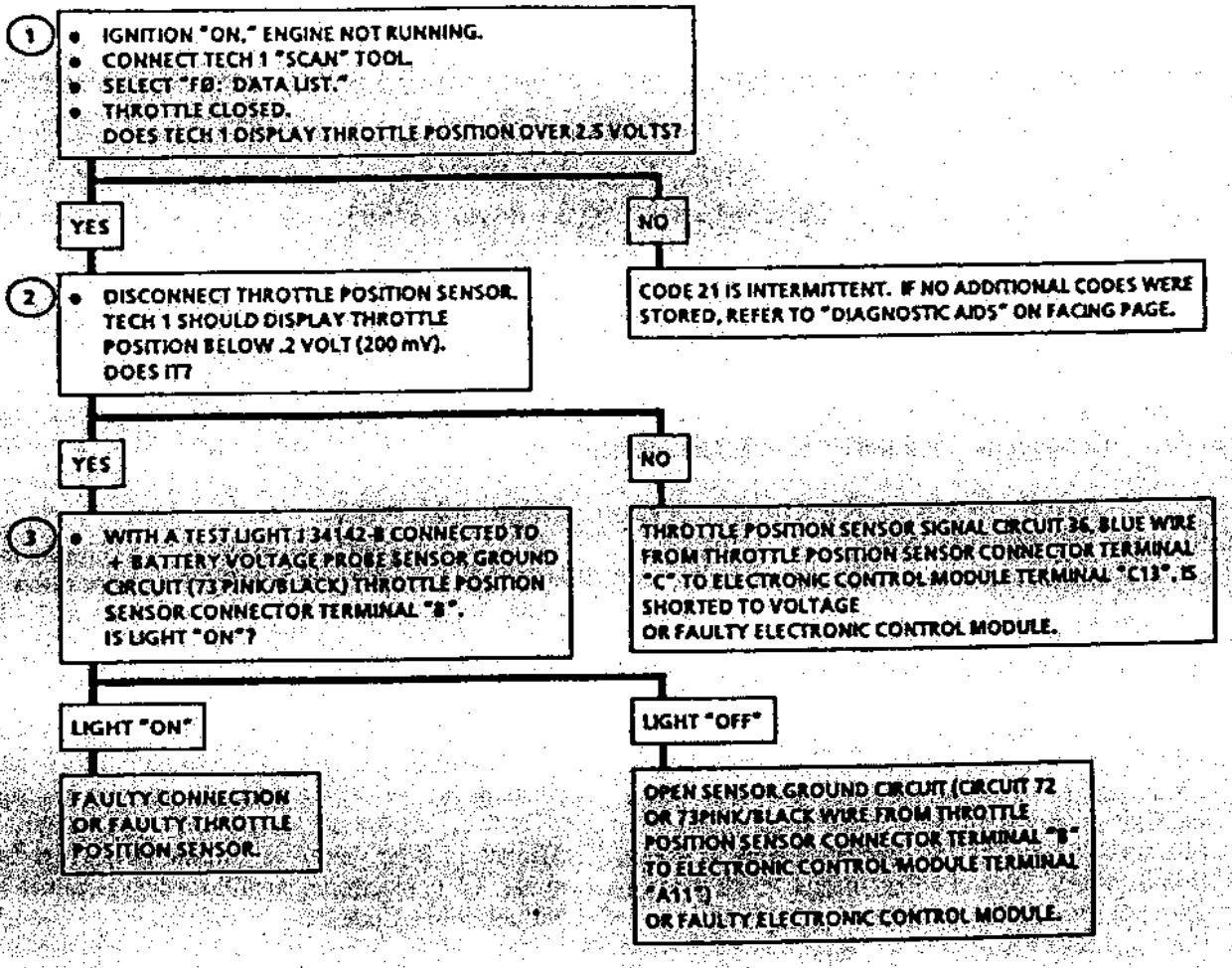
Diagnostic Aids:

A Tech 1 "Scan" tool reads throttle position in volts. With ignition "ON" or at idle, throttle position sensor signal voltage should read between 0.25 to 1.25 volts with the throttle closed and increase at a steady rate as throttle is moved toward wide open throttle. An open in coolant temperature sensor and throttle position sensor ground circuit (Circuit 72/73 Pink/Black wire from throttle position sensor connector terminal "B" to electronic control module terminal "A11") will result in a Code 21.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

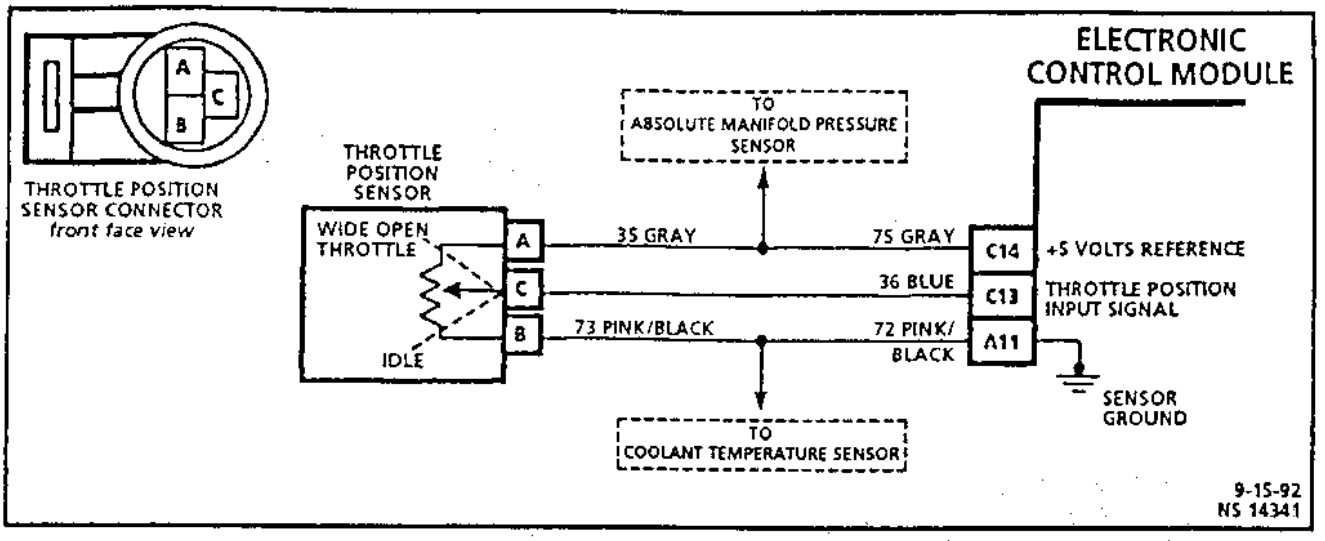
CODE 21

THROTTLE POSITION (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA


1
• IGNITION "ON," ENGINE NOT RUNNING.
• CONNECT TECH 1 "SCAN" TOOL.
• SELECT "F0: DATA LIST."
• THROTTLE CLOSED.
DOES TECH 1 DISPLAY THROTTLE POSITION OVER 2.5 VOLTS?
YES
NO
CODE 21 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
2
• DISCONNECT THROTTLE POSITION SENSOR. TECH 1 SHOULD DISPLAY THROTTLE POSITION BELOW .2 VOLT (200 mV). DOES IT?
YES
NO
THROTTLE POSITION SENSOR SIGNAL CIRCUIT 36, BLUE WIRE FROM THROTTLE POSITION SENSOR CONNECTOR TERMINAL "C" TO ELECTRONIC CONTROL MODULE TERMINAL "C13", IS SHORTED TO VOLTAGE OR FAULTY ELECTRONIC CONTROL MODULE.
3
• WITH A TEST LIGHT J 34142-B CONNECTED TO + BATTERY VOLTAGE PROBE SENSOR GROUND CIRCUIT (73 PINK/BLACK) THROTTLE POSITION SENSOR CONNECTOR TERMINAL "B". IS LIGHT "ON"?
LIGHT "ON"
LIGHT "OFF"
FAULTY CONNECTION OR FAULTY THROTTLE POSITION SENSOR.
OPEN SENSOR GROUND CIRCUIT (CIRCUIT 72 OR 73 PINK/BLACK WIRE FROM THROTTLE POSITION SENSOR CONNECTOR TERMINAL "B" TO ELECTRONIC CONTROL MODULE TERMINAL "A11") OR FAULTY ELECTRONIC CONTROL MODULE.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-27-92
NS 14342



CODE 22

THROTTLE POSITION (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The throttle position sensor provides a voltage signal that changes relative to the throttle blade. Throttle position sensor signal voltage varies from about 0.25 to 1.25 volts at idle to about 5 volts at wide open throttle.

The throttle position sensor signal is one of the inputs used by the electronic control module for fuel control and for most of the electronic control module controlled outputs.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 22 will set if:
   - Engine has been running.
   - Throttle position sensor signal voltage is less than 0.16 volt.

   The throttle position sensor has an auto zeroing feature. If the voltage reading is within the range of about 0.25 to 1.25 volts, the electronic control module will use that value as closed throttle. If the voltage reading is out of the auto zero range at closed throttle, check for a binding throttle cable or damaged linkage, if OK, continue with diagnosis.
2. This step simulates Code 21: (high voltage). If the electronic control module recognizes the high signal voltage, then the electronic control module and wiring are OK.
3. This simulates a high signal voltage to check for an open in throttle position sensor signal input circuit (Circuit 36 Blue wire from throttle position sensor terminal "C" to electronic control module terminal "C13"). The Tech 1 "Scan" tool will not read up to 12 volts, but what is important is that the electronic control module recognizes the signal on throttle position sensor signal input circuit.

Diagnostic Aids:

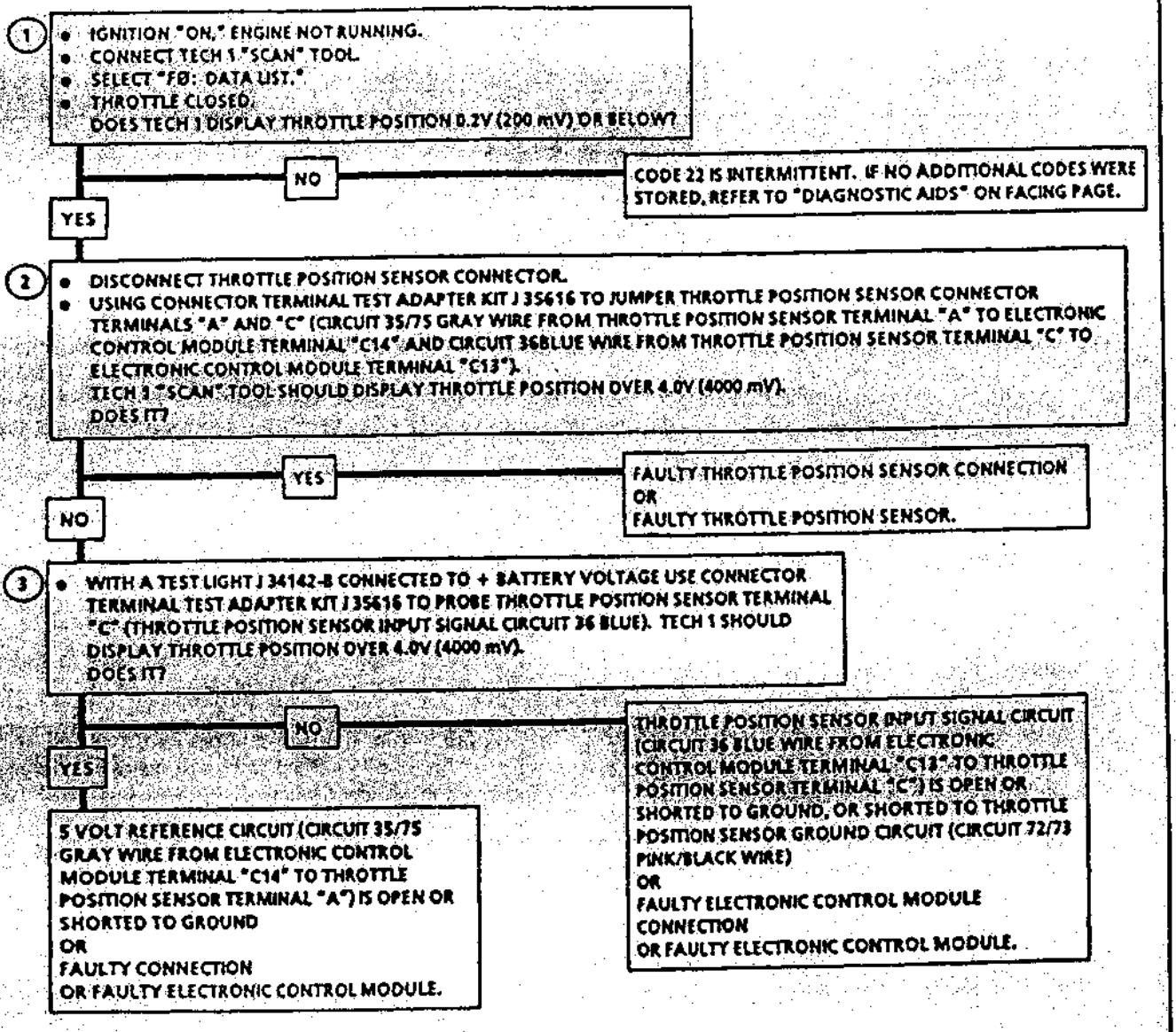
A Tech 1 "Scan" tool reads throttle position in volts. With ignition "ON" or at idle, throttle position sensor signal voltage should read between 0.25 to 1.25 volts with the throttle closed and increase at a steady rate as throttle is moved toward wide open throttle.

An open or short to ground in +5 volt reference circuit (Circuit 35/75 Gray wire from throttle position sensor terminal "A" to electronic control module terminal "C14") or throttle position sensor signal input circuit (Circuit 36 Blue wire from throttle position sensor terminal "C" to electronic control module terminal "C13") will result in a Code 22.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

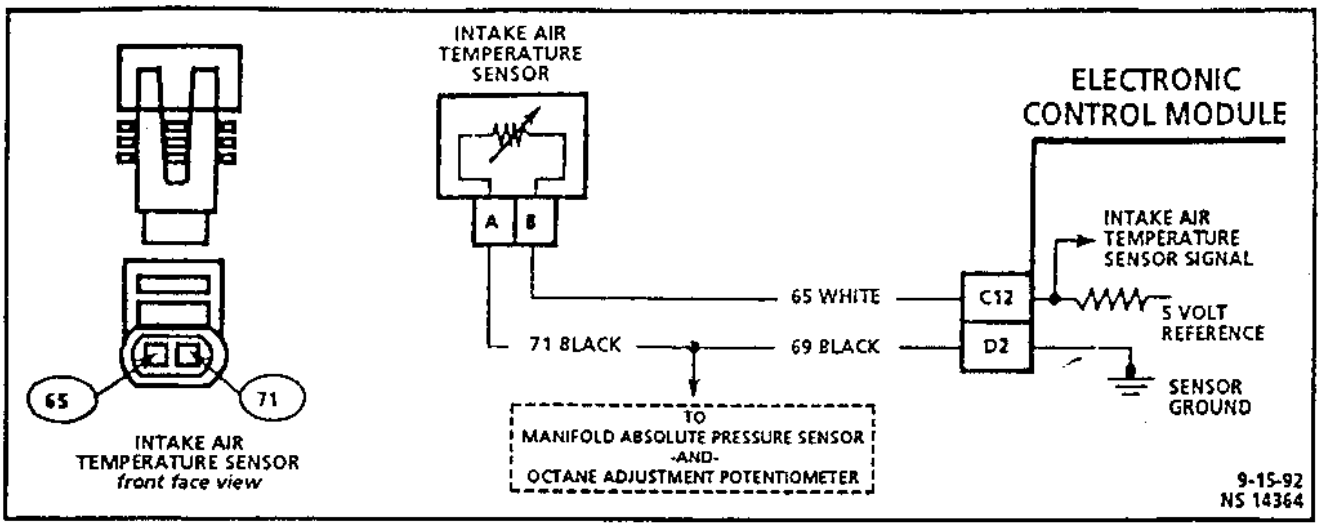
CODE 22

THROTTLE POSITION (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA


1
• IGNITION "ON," ENGINE NOT RUNNING.
• CONNECT TECH 1 "SCAN" TOOL.
• SELECT "F0: DATA LIST."
• THROTTLE CLOSED.
DOES TECH 1 DISPLAY THROTTLE POSITION 0.2V (200 mV) OR BELOW?
NO
CODE 22 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
YES
2
• DISCONNECT THROTTLE POSITION SENSOR CONNECTOR.
• USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER THROTTLE POSITION SENSOR CONNECTOR TERMINALS "A" AND "C" (CIRCUIT 35/75 GRAY WIRE FROM THROTTLE POSITION SENSOR TERMINAL "A" TO ELECTRONIC CONTROL MODULE TERMINAL "C14" AND CIRCUIT 36BLUE WIRE FROM THROTTLE POSITION SENSOR TERMINAL "C" TO ELECTRONIC CONTROL MODULE TERMINAL "C13").
TECH 1 "SCAN" TOOL SHOULD DISPLAY THROTTLE POSITION OVER 4.0V (4000 mV).
DOES IT?
YES
FAULTY THROTTLE POSITION SENSOR CONNECTION
OR
FAULTY THROTTLE POSITION SENSOR.
NO
3
• WITH A TEST LIGHT J 34142-B CONNECTED TO + BATTERY VOLTAGE USE CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO PROBE THROTTLE POSITION SENSOR TERMINAL "C" (THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT 36 BLUE). TECH 1 SHOULD DISPLAY THROTTLE POSITION OVER 4.0V (4000 mV).
DOES IT?
NO
THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 36 BLUE WIRE FROM ELECTRONIC CONTROL MODULE TERMINAL "C13" TO THROTTLE POSITION SENSOR TERMINAL "C") IS OPEN OR SHORTED TO GROUND, OR SHORTED TO THROTTLE POSITION SENSOR GROUND CIRCUIT (CIRCUIT 72/73 PINK/BLACK WIRE)
OR
FAULTY ELECTRONIC CONTROL MODULE CONNECTION
OR FAULTY ELECTRONIC CONTROL MODULE.
YES
5 VOLT REFERENCE CIRCUIT (CIRCUIT 35/75 GRAY WIRE FROM ELECTRONIC CONTROL MODULE TERMINAL "C14" TO THROTTLE POSITION SENSOR TERMINAL "A") IS OPEN OR SHORTED TO GROUND
OR
FAULTY CONNECTION
OR FAULTY ELECTRONIC CONTROL MODULE.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

6-2-92
NS 14361



CODE 23

INTAKE AIR TEMPERATURE (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The intake air temperature sensor uses a thermistor to control the signal voltage to the electronic control module. The electronic control module applies a voltage (about 5 volts) on Circuit 65 White wire to the sensor. When the intake air is cold the sensor (thermistor) resistance is high, therefore, the electronic control module will see a high signal voltage. As the air warms, the sensor resistance becomes low, therefore, the electronic control module will see a low voltage.

The intake air temperature sensor is located in the air cleaner.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 23 will set if:
   - Ignition "ON."

   OR
   - Engine has been running longer than 29 seconds.
   - Intake air temperature sensor signal voltage indicates an intake air temperature below 39°C.
2. A Code 23 will set due to an open sensor wire or connection. This test will determine if the wiring and electronic control module are OK.
3. This will determine if the signal Circuit 65 White wire or the intake air temperature sensor ground Circuit 69/71 Black wire is open.

Diagnostic Aids:

A Tech 1 "Scan" tool reads temperature of the air entering the engine and should read close to ambient air temperature when engine is cold, and rises as engine compartment temperature increases.

A faulty connection or an open in Circuit 65 White wire or Circuit 69/71 Black wire will result in a Code 23 and or Code 33, Code 54.

Refer to Intermittents in "Symptoms," Section "2.9B".

CODE 23

INTAKE AIR TEMPERATURE (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA

1. • DOES TECH 1 SCAN TOOL DISPLAY INTAKE AIR TEMPERATURE -30°C OR COLDER?

   YES

2. • DISCONNECT INTAKE AIR TEMPERATURE SENSOR.
   • JUMPER HARNESS TERMINALS "A" AND "B" TOGETHER.
   • TECH 1 SCAN TOOL SHOULD DISPLAY TEMPERATURE OVER 130°C.
   DOES IT?

   YES

   FAULTY CONNECTION OR FAULTY SENSOR.

   NO

3. • USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER CIRCUIT 65 WHITE WIRE TO GROUND.
   • TECH 1 SCAN TOOL SHOULD DISPLAY TEMPERATURE OVER 130°C.
   DOES IT?

   YES

   OPEN SENSOR GROUND CIRCUIT 69/71 BLACK WIRE, OR FAULTY CONNECTION OR FAULTY ELECTRONIC CONTROL MODULE.

   NO

   OPEN CIRCUIT 65 WHITE WIRE, OR FAULTY CONNECTION OR FAULTY ELECTRONIC CONTROL MODULE.

   NO

   CODE 23 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

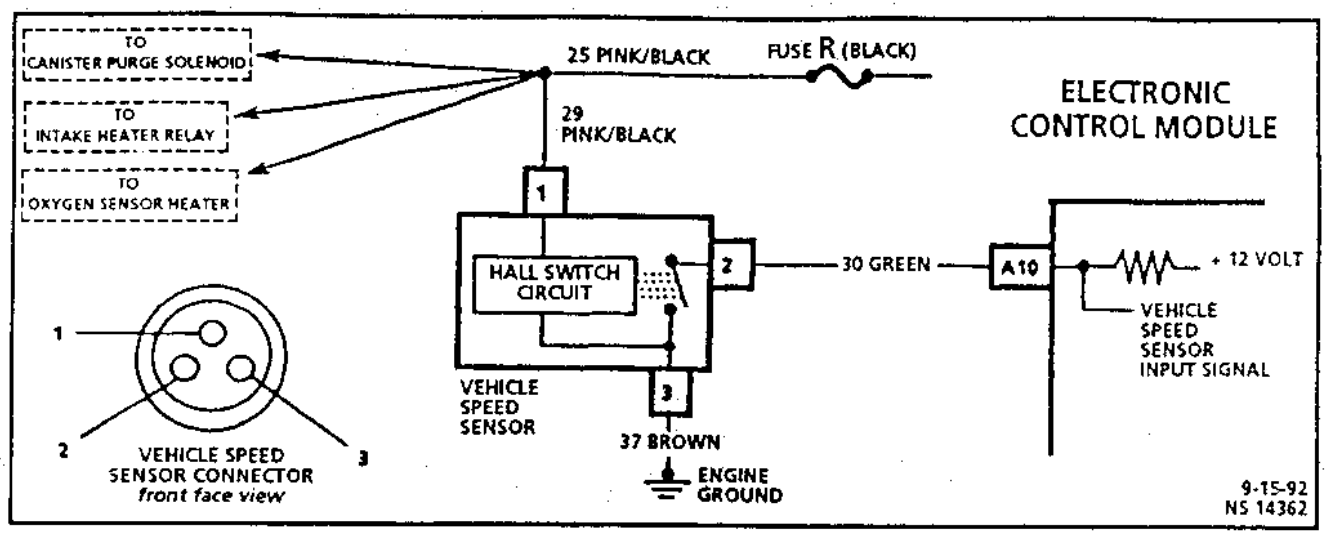
DIAGNOSTIC AID

INTAKE AIR TEMPERATURE SENSOR
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C	OHMS
100	177
90	241
80	332
70	467
60	667
50	973
45	1188
40	1459
35	1802
30	2238
25	2796
20	3520
15	4450
10	5670
5	7280
0	9420
-5	12300
-10	16180
-15	21450
-20	28680
-30	52700
-40	100700

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-26-92
NS 14343



CODE 24

NO VEHICLE SPEED SIGNAL
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The electronic control module terminal "A10" applies and monitors 12 volts on vehicle speed sensor input signal Circuit 30 Green wire. The vehicle speed sensor alternately grounds vehicle speed sensor input signal circuit when the drive wheels are turning. This pulsing action takes place about 1242 times per kilometer and the electronic control module calculates vehicle speed based on the time between "pulses."

Tech 1 "Scan" tool reading should closely match the speedometer reading with the drive wheels turning and vehicle speed over about 3 km/h.

Disregard a Code 24 set when drive wheels are not turning.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

Code 24 will set if the following conditions exist for longer than 3 seconds.

- Codes 21, 22, 33 and 34 are not set.
- Engine revolutions per minute are between 2000 and 4400.
- Manifold absolute pressure is less than 23 kPa.
- The throttle is closed.
- Vehicle speed signal indicates less than or equal to 10 km/h.

1. This test uses the "Scan" tool to verify the vehicle speed sensor sensor operation.
2. The electronic control module supplies 12 volts to vehicle speed sensor input signal circuit but this signal will not light the test light. This step verifies that vehicle speed sensor input signal circuit is not shorted to a voltage source.
3. By probing vehicle speed sensor input signal circuit with the test light several times a second a vehicle speed signal should be generated and displayed on the "Scan" tool.
4. This test must be done using a voltmeter and will check for the 12 volts being supplied to vehicle speed sensor input signal circuit by the electronic control module.
5. This is the ignition feed circuit that supplies operating power to the vehicle speed sensor.
6. This circuit supplies the ground path for vehicle speed sensor operation. If this circuit is open, vehicle speed sensor cannot pulse vehicle speed sensor input signal circuit to ground.

Diagnostic Aids:

The Tech 1 "Scan" tool should indicate a vehicle speed whenever the drive wheels are turning greater than 3 km/h.

If vehicle speed signal is not present, engine may stall at closed throttle coastdown speeds due to wrong vehicle speed data to electronic control module.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

CODE 24

NO VEHICLE SPEED SIGNAL
1.7L THROTTLE BODY INJECTION NIVA

DISREGARD CODE 24, IF SET WHILE DRIVE WHEELS ARE NOT TURNING

1
- ATTACH TECH 1 "SCAN" TOOL.
- SELECT "FØ: DATA LIST."
- RAISE VEHICLE SO THAT ALL TIRES CAN ROTATE FREELY.
- WITH ENGINE IDLING IN GEAR, TECH 1 "SCAN" TOOL SHOULD DISPLAY KM/H ABOVE 0. DOES IT?

NO

YES → CODE 24 IS INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

2
- IGNITION "ON" ENGINE NOT RUNNING.
- DISCONNECT "VEHICLE SPEED SENSOR" CONNECTOR.
- WITH TEST LIGHT J 34142-B CONNECTED TO GROUND PROBE VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 30 GREEN WIRE TO ELECTRONIC CONTROL MODULE TERMINAL "A10"), IS LIGHT "ON"?

NO

YES → REPAIR SHORT TO VOLTAGE IN VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 30 GREEN WIRE TO ELECTRONIC CONTROL MODULE TERMINAL "A10").

3
- USING TEST LIGHT J 34142-B MOMENTARILY TOUCH VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 30 GREEN WIRE TO ELECTRONIC CONTROL MODULE TERMINAL "A10") SEVERAL TIMES A SECOND WHILE OBSERVING VEHICLE SPEED SENSOR SIGNAL ON TECH 1 "SCAN" TOOL. DOES TECH 1 DISPLAY VEHICLE SPEED ABOVE 0 KM/H?

NO

4
- USING DIGITAL VOLT OHM AMP MULTIMETER, CHECK VOLTAGE ON VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 30 GREEN WIRE TO ELECTRONIC CONTROL MODULE TERMINAL "A10"). IS VOLTAGE GREATER THAN 10 VOLTS?

YES → REPLACE ELECTRONIC CONTROL MODULE.

NO → VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 30 GREEN WIRE TO ELECTRONIC CONTROL MODULE TERMINAL "A10") OPEN, SHORTED TO GROUND OR FAULTY ELECTRONIC CONTROL MODULE.

YES

5
- WITH TEST LIGHT J 34142-B CONNECTED TO GROUND, PROBE POWER SOURCE TO VEHICLE SPEED SENSOR (CIRCUIT 29/25 PINK/BLACK WIRE FROM FUSE "R" TO VEHICLE SPEED SENSOR CONNECTOR TERMINAL "1"). IS LIGHT "ON"?

NO → CHECK FUSE "R". REPAIR OPEN IN VEHICLE SPEED SENSOR POWER SOURCE CIRCUIT 29/25 PINK/BLACK.

YES

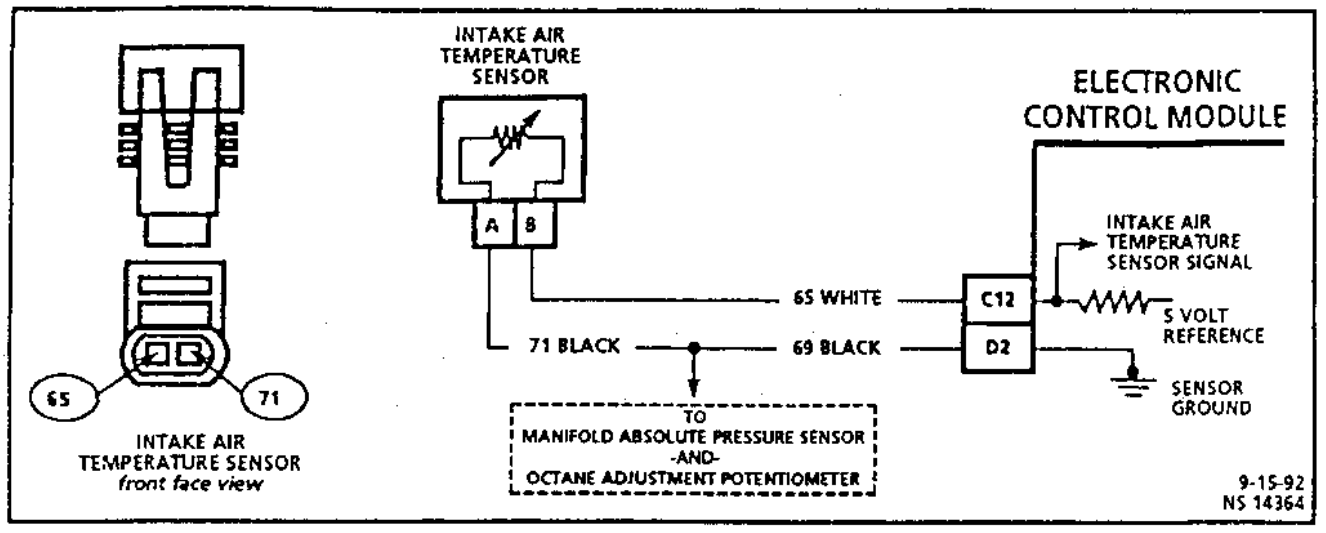
6
- WITH TEST LIGHT J 34142-B CONNECTED TO 12 VOLTS PROBE VEHICLE SPEED SENSOR GROUND CIRCUIT (CIRCUIT 37 BROWN WIRE FROM VEHICLE SPEED SENSOR CONNECTOR TERMINAL "3" TO HARNESS GROUND). IS TEST LIGHT "ON"?

YES → FAULTY VEHICLE SPEED SENSOR CONNECTION OR FAULTY VEHICLE SPEED SENSOR.

NO → REPAIR OPEN VEHICLE SPEED SENSOR GROUND CIRCUIT (CIRCUIT 37 BROWN WIRE FROM VEHICLE SPEED SENSOR CONNECTOR TERMINAL "3" TO HARNESS GROUND).

5-26-92
NS 14363

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.



CODE 25

INTAKE AIR TEMPERATURE (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The intake air temperature sensor uses a thermistor to control the signal voltage to the electronic control module. The electronic control module applies a voltage (about 5 volts) on Circuit 65 White to the sensor. When intake air is cold, the sensor (thermistor) resistance is high. Therefore, the electronic control module will see a high signal voltage. As the air warms, the sensor resistance becomes less and the voltage drops.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

A Code 25 will set if:

1. Intake air temperature greater than 140°C is detected for approximately 1 second with the engine running.

Diagnostic Aids:

If the engine has been allowed to cool to an ambient temperature (overnight), the coolant temperature and intake air temperature may be checked with a Tech 1 "Scan" tool and should read close to each other.

A Code 25 will result if Circuit 65 White is shorted to ground.

If Code 25 is intermittent, refer to "Symptoms," Section "2.9B."

CODE 25

INTAKE AIR TEMPERATURE (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

1. DOES TECH 1 SCAN TOOL DISPLAY INTAKE AIR TEMPERATURE OF 130°C OR HOTTER?

NO → CODE 25 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.

YES →

- DISCONNECT INTAKE AIR TEMPERATURE SENSOR. TECH 1 SCAN TOOL SHOULD DISPLAY TEMPERATURE BELOW -30°C. DOES IT?

NO → CIRCUIT 65 WHITE WIRE SHORTED TO GROUND OR TO SENSOR GROUND CIRCUIT 69/71 BLACK WIRE OR FAULTY ELECTRONIC CONTROL MODULE.

YES → REPLACE INTAKE AIR TEMPERATURE SENSOR.

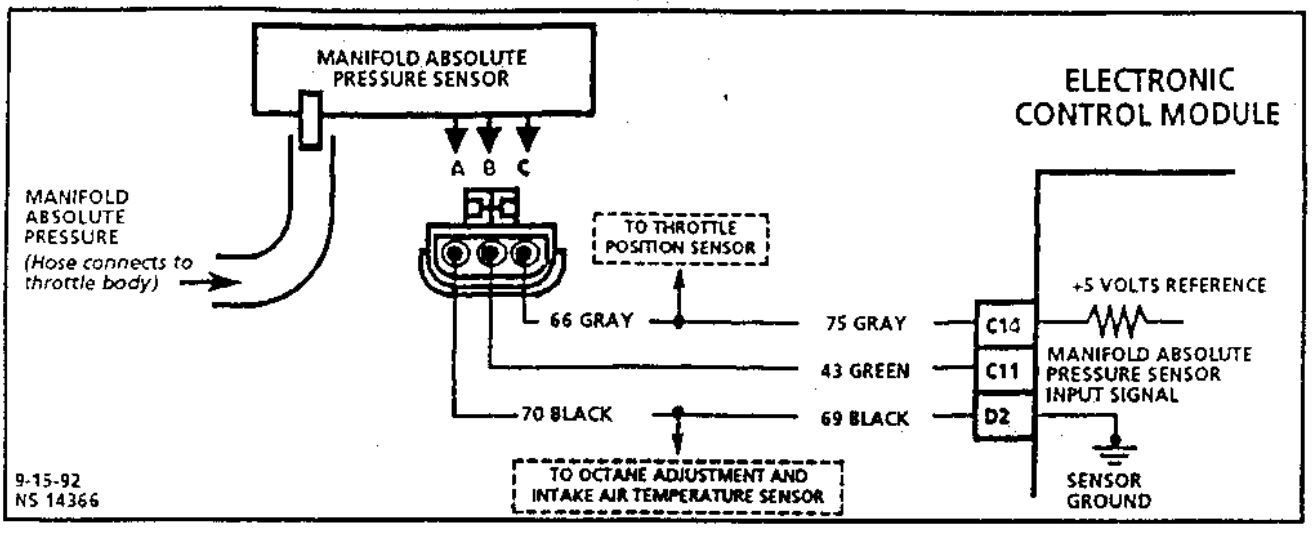
DIAGNOSTIC AID

INTAKE AIR TEMPERATURE SENSOR
TEMPERATURE VS. RESISTANCE VALUES (APPROXIMATE)

°C		OHMS
100		177
90		241
80		332
70		467
60		667
50		973
45		1188
40		1459
35		1802
30		2238
25		2796
20		3520
15		4450
10		5670
5		7280
0		9420
-5		12300
-10		16180
-15		21450
-20		28680
-30		52700
-40		100700

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-26-92
NS 14365



CODE 33
MANIFOLD ABSOLUTE PRESSURE (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The manifold absolute pressure sensor responds to changes in intake manifold pressure. The electronic control module receives this information as a signal voltage that will vary from about 1–1.5 volts at idle to 4–4.5 volts at wide open throttle.

The Tech 1 "Scan" tool displays manifold pressure in volts and kilopascals pressure. Low pressure reads a low voltage while a high pressure reads a high voltage.

If the manifold absolute pressure sensor fails the electronic control module will substitute a fixed manifold absolute pressure value and use the throttle position sensor to control fuel delivery.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 33 will set if:
   - Engine has been running.
   - Malfunction Code 21 or 22 are not set.
   - Throttle position sensor less than 1.6%.
   - Manifold absolute pressure sensor signal voltage is too high (greater than 76 kPa of pressure) for a time greater than approximately five seconds.

   Engine misfire or a low unstable idle may set Code 33. Disconnect manifold absolute pressure sensor electrical connector and system will use a default manifold absolute pressure value. If the misfire or idle condition remains, see "Symptoms," in Section "2.9B".
2. If the electronic control module recognizes and the Tech 1 "Scan" tool displays the low manifold absolute pressure signal, the electronic control module and wiring are OK.

Diagnostic Aids:

If the idle is rough or unstable, refer to "Symptoms," Section "2.9B" for items which can cause an unstable idle.

An open in octane adjustment, intake air temperature sensor and manifold absolute pressure sensor ground circuit (Circuit 69/70 Black wire from manifold absolute pressure sensor connector terminal "A" to electronic control module terminal "D2") will result in a Code 33, and/or Code 23 and Code 54.

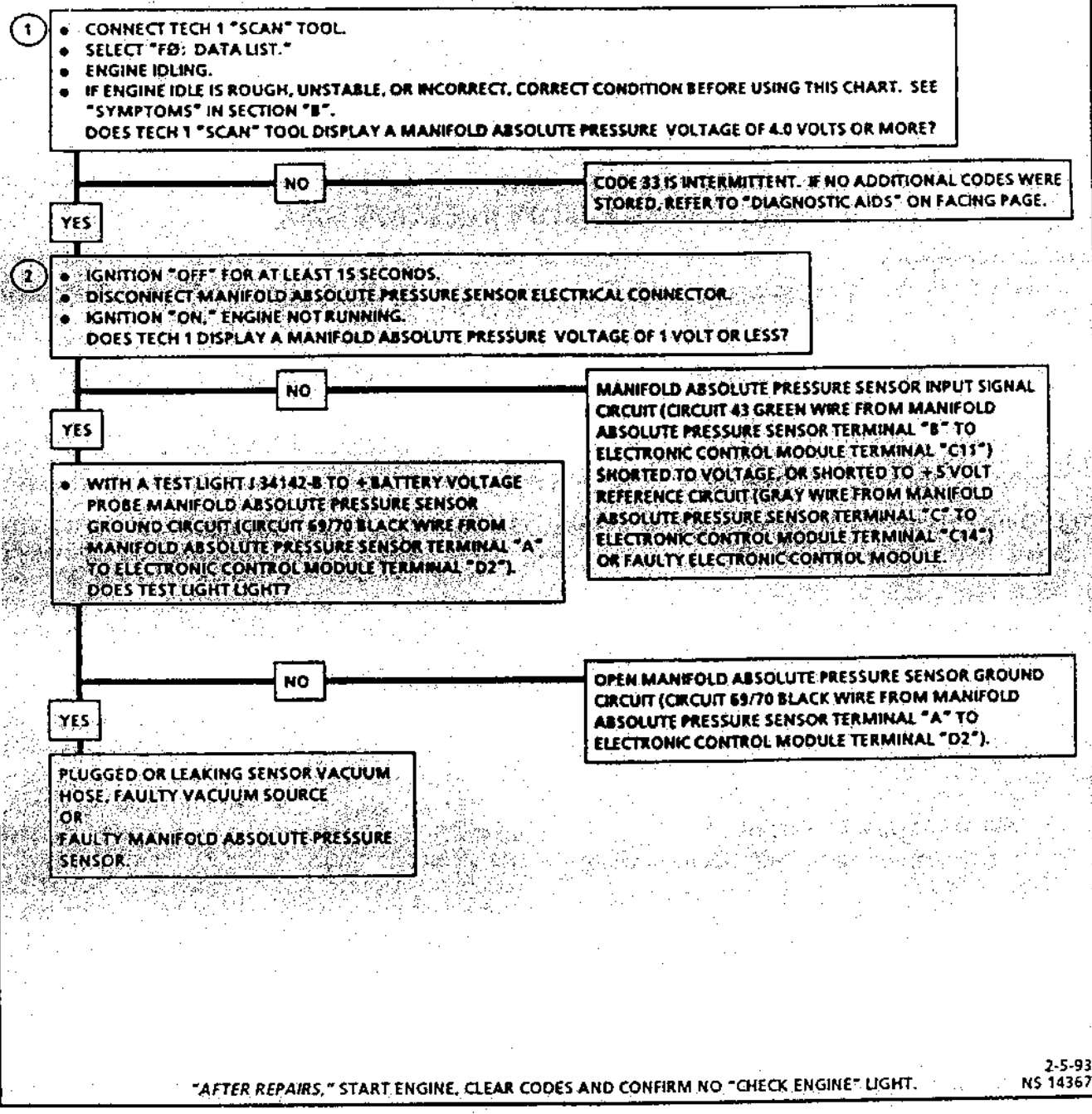
With the ignition "ON" and the engine not running, the manifold pressure is equal to atmospheric pressure and the signal voltage may be high. This information is used by the electronic control module as an indication of vehicle altitude and is referred to as barometric pressure. Comparison of this barometric reading with a sensor in a known good vehicle is a good way to check accuracy of a "suspect" sensor, the reading should be the same +0.2 volt. Also, CHART C-1D can be used to test the manifold absolute pressure sensor.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

If vacuum hose is disconnected or leaking, idle air control counts will be close to zero (0) and engine may idle with high engine speed.

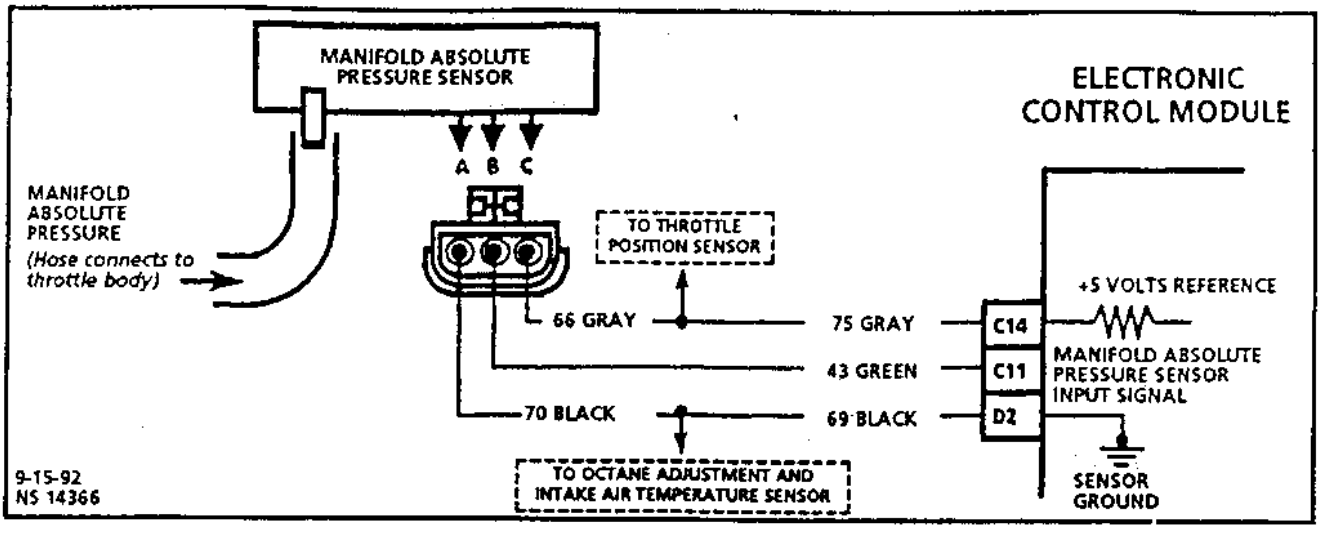
CODE 33

MANIFOLD ABSOLUTE PRESSURE (SIGNAL VOLTAGE TOO HIGH) 1.7L THROTTLE BODY INJECTION NIVA


1
• CONNECT TECH 1 "SCAN" TOOL.
• SELECT "FØ: DATA LIST."
• ENGINE IDLING.
• IF ENGINE IDLE IS ROUGH, UNSTABLE, OR INCORRECT, CORRECT CONDITION BEFORE USING THIS CHART. SEE "SYMPTOMS" IN SECTION "B".
DOES TECH 1 "SCAN" TOOL DISPLAY A MANIFOLD ABSOLUTE PRESSURE VOLTAGE OF 4.0 VOLTS OR MORE?
NO
CODE 33 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
YES
2
• IGNITION "OFF" FOR AT LEAST 15 SECONDS.
• DISCONNECT MANIFOLD ABSOLUTE PRESSURE SENSOR ELECTRICAL CONNECTOR.
• IGNITION "ON," ENGINE NOT RUNNING.
DOES TECH 1 DISPLAY A MANIFOLD ABSOLUTE PRESSURE VOLTAGE OF 1 VOLT OR LESS?
NO
MANIFOLD ABSOLUTE PRESSURE SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 43 GREEN WIRE FROM MANIFOLD ABSOLUTE PRESSURE SENSOR TERMINAL "B" TO ELECTRONIC CONTROL MODULE TERMINAL "C11") SHORTED TO VOLTAGE, OR SHORTED TO +5 VOLT REFERENCE CIRCUIT (GRAY WIRE FROM MANIFOLD ABSOLUTE PRESSURE SENSOR TERMINAL "C" TO ELECTRONIC CONTROL MODULE TERMINAL "C14") OR FAULTY ELECTRONIC CONTROL MODULE.
YES
• WITH A TEST LIGHT J 34142-B TO +BATTERY VOLTAGE PROBE MANIFOLD ABSOLUTE PRESSURE SENSOR GROUND CIRCUIT (CIRCUIT 69/70 BLACK WIRE FROM MANIFOLD ABSOLUTE PRESSURE SENSOR TERMINAL "A" TO ELECTRONIC CONTROL MODULE TERMINAL "D2").
DOES TEST LIGHT LIGHT?
NO
OPEN MANIFOLD ABSOLUTE PRESSURE SENSOR GROUND CIRCUIT (CIRCUIT 69/70 BLACK WIRE FROM MANIFOLD ABSOLUTE PRESSURE SENSOR TERMINAL "A" TO ELECTRONIC CONTROL MODULE TERMINAL "D2").
YES
PLUGGED OR LEAKING SENSOR VACUUM HOSE, FAULTY VACUUM SOURCE
OR
FAULTY MANIFOLD ABSOLUTE PRESSURE SENSOR.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

2-5-93
NS 14367



CODE 34

MANIFOLD ABSOLUTE PRESSURE (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The manifold absolute pressure sensor responds to changes in intake manifold pressure. The electronic control module receives this information as a signal voltage that will vary from about 1–1.5 volts at idle to 4–4.5 volts at wide open throttle.

The Tech 1 "Scan" tool displays manifold pressure in voltage and kilopascals pressure. Low pressure reads a low voltage while a high pressure reads a high voltage.

If the manifold absolute pressure sensor fails the electronic control module will substitute a fixed manifold absolute pressure value and use the throttle position sensor to control fuel delivery.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 34 will set if:
   - Malfunction Code 21 is not set.
   - Engine speed is less than 1200 revolutions per minute.
   - Manifold absolute pressure sensor signal voltage is too low (less than 14 kPa of pressure) for less than one second.

   OR
   - Malfunction Code 21 is not set.
   - Engine speed is greater than 1200 revolutions per minute.
   - Throttle position greater than 20%.
   - Manifold absolute pressure sensor signal voltage is too low (less than 14 kPa of pressure) for less than one second.
2. If the electronic control module recognizes the high manifold absolute pressure signal, the electronic control module and wiring are OK.
3. The Tech 1 "Scan" tool may not display 12 volts. The important thing is that the electronic control module recognizes the voltage as more than 4 volts, indicating that the electronic control module and manifold absolute pressure sensor input signal circuit are OK.

Diagnostic Aids:

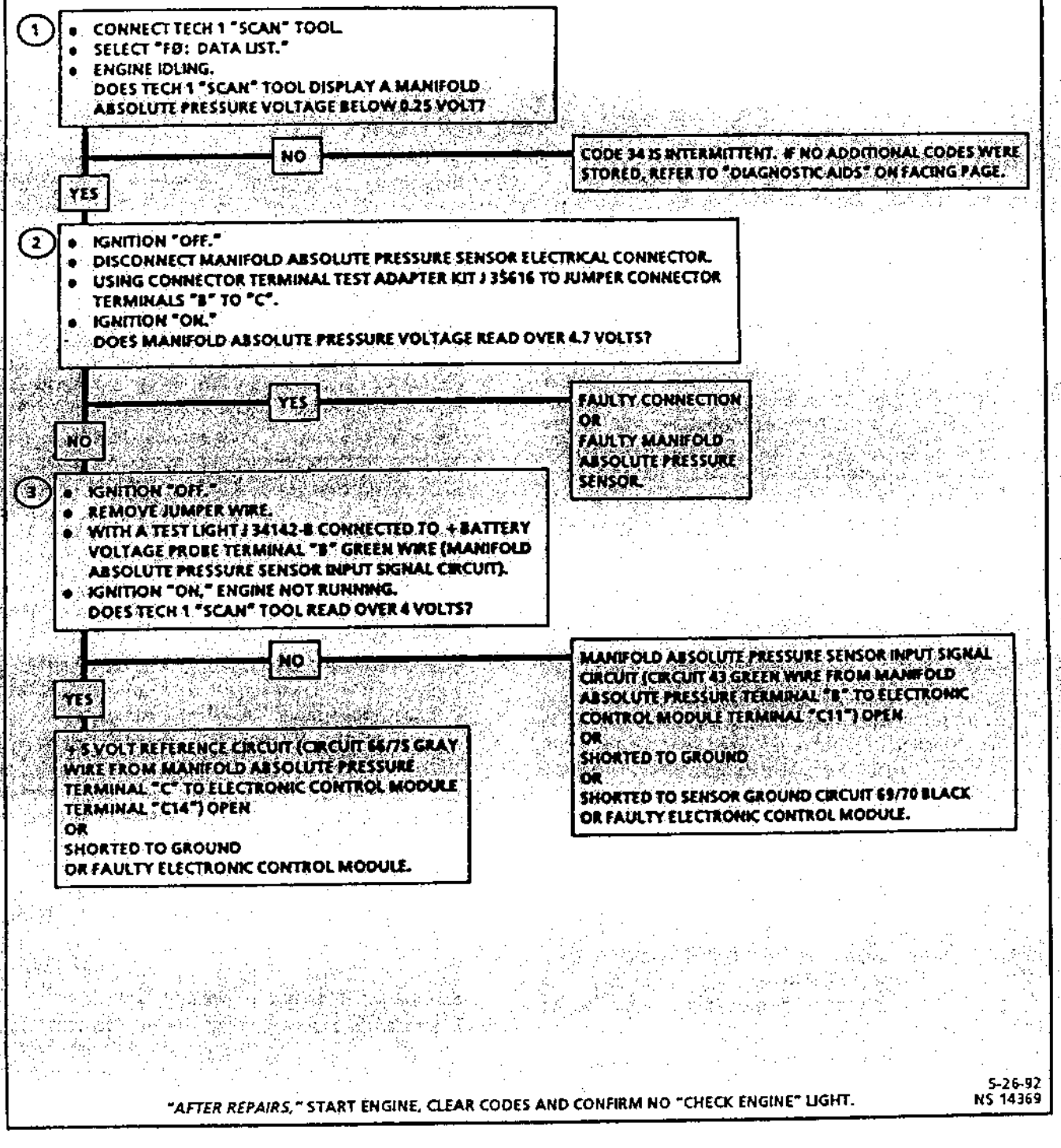
An intermittent open in manifold absolute pressure sensor input signal circuit or +5 volt reference circuit will result in a Code 34.

With the ignition "ON" and the engine not running, the manifold pressure is equal to atmospheric pressure and the signal voltage will be high. This information is used by the electronic control module as an indication of vehicle altitude and is referred to as barometric pressure. Comparison of this barometric reading with a sensor in a known good vehicle is a good way to check accuracy of a "suspect" sensor, the reading should be the same ±0.2 volt. Also, CHART C-1D can be used to test the manifold absolute pressure sensor.

Refer to "Intermittents" in "Symptoms," Section "2.9B".

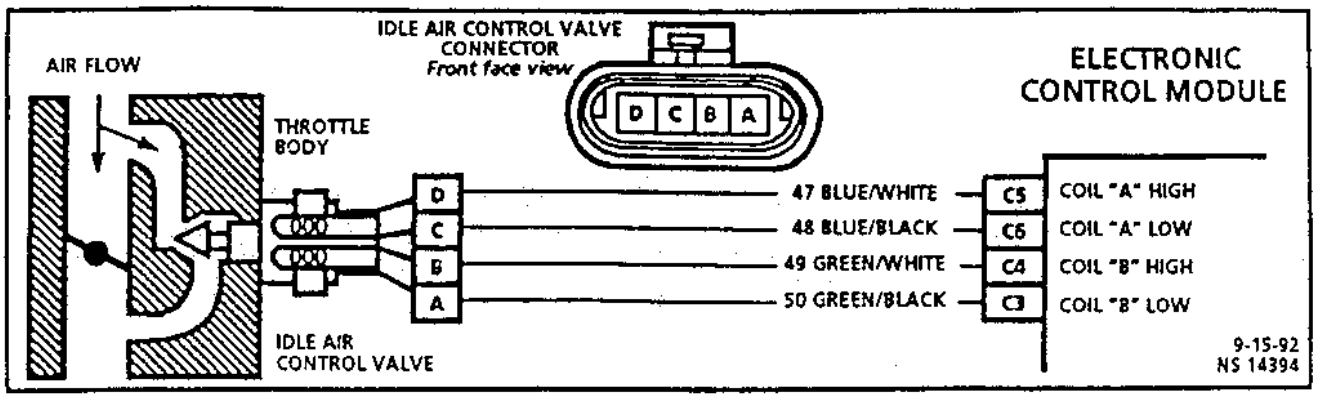
CODE 34

MANIFOLD ABSOLUTE PRESSURE (SIGNAL VOLTAGE TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA


1
• CONNECT TECH 1 "SCAN" TOOL.
• SELECT "F0: DATA LIST."
• ENGINE IDLING.
DOES TECH 1 "SCAN" TOOL DISPLAY A MANIFOLD ABSOLUTE PRESSURE VOLTAGE BELOW 0.25 VOLT?
NO
CODE 34 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
YES
2
• IGNITION "OFF."
• DISCONNECT MANIFOLD ABSOLUTE PRESSURE SENSOR ELECTRICAL CONNECTOR.
• USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 TO JUMPER CONNECTOR TERMINALS "B" TO "C".
• IGNITION "ON."
DOES MANIFOLD ABSOLUTE PRESSURE VOLTAGE READ OVER 4.7 VOLTS?
YES
FAULTY CONNECTION OR FAULTY MANIFOLD ABSOLUTE PRESSURE SENSOR.
NO
3
• IGNITION "OFF."
• REMOVE JUMPER WIRE.
• WITH A TEST LIGHT J 34142-B CONNECTED TO +BATTERY VOLTAGE PROBE TERMINAL "B" GREEN WIRE (MANIFOLD ABSOLUTE PRESSURE SENSOR INPUT SIGNAL CIRCUIT).
• IGNITION "ON," ENGINE NOT RUNNING.
DOES TECH 1 "SCAN" TOOL READ OVER 4 VOLTS?
NO
MANIFOLD ABSOLUTE PRESSURE SENSOR INPUT SIGNAL CIRCUIT (CIRCUIT 43 GREEN WIRE FROM MANIFOLD ABSOLUTE PRESSURE TERMINAL "B" TO ELECTRONIC CONTROL MODULE TERMINAL "C11") OPEN
OR
SHORTED TO GROUND
OR
SHORTED TO SENSOR GROUND CIRCUIT 69/70 BLACK
OR FAULTY ELECTRONIC CONTROL MODULE.
YES
+ 5 VOLT REFERENCE CIRCUIT (CIRCUIT 66/75 GRAY WIRE FROM MANIFOLD ABSOLUTE PRESSURE TERMINAL "C" TO ELECTRONIC CONTROL MODULE TERMINAL "C14") OPEN
OR
SHORTED TO GROUND
OR FAULTY ELECTRONIC CONTROL MODULE.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-26-92
NS 14369



CODE 35

IDLE SPEED ERROR
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

Code 35 will set if the closed throttle engine speed is 150 revolutions per minute above the desired (commanded) idle speed for more than 3 seconds. Review the general description of the idle air control operation in "Fuel Metering System," Section "1.2".

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. The Tech 1 "Scan" tool revolutions per minute control mode is used to extend and retract the Idle air control valve. The valve should move smoothly within the specified range. If the idle speed is commanded (idle air control extended) too low (below 700 revolutions per minute), the engine may stall. This may be normal and would not indicate a problem. Retracting the idle air control beyond its controlled range (above 1500 revolutions per minute) will cause a delay before the revolutions per minute start dropping. This too is normal.
2. This test uses the Tech 1 "Scan" tool to command the idle air control controlled idle speed. The electronic control module issues commands to obtain commanded idle speed. The node lights each should flash red and green to indicate a good circuit as the electronic control module issues commands. While the sequence of color is not important if either light is "OFF" or does not flash red and green, check the circuits for faults, beginning with poor terminal contacts.

Diagnostic Aids:

A slow, unstable, or fast idle may be caused by a non-idle air control system problem that cannot be overcome by the idle air control valve. Out of control range idle air control "Scan" tool counts will be above 60 if idle is too low and zero counts if idle is too high. The following checks should be made to repair a non-idle air control system problem:

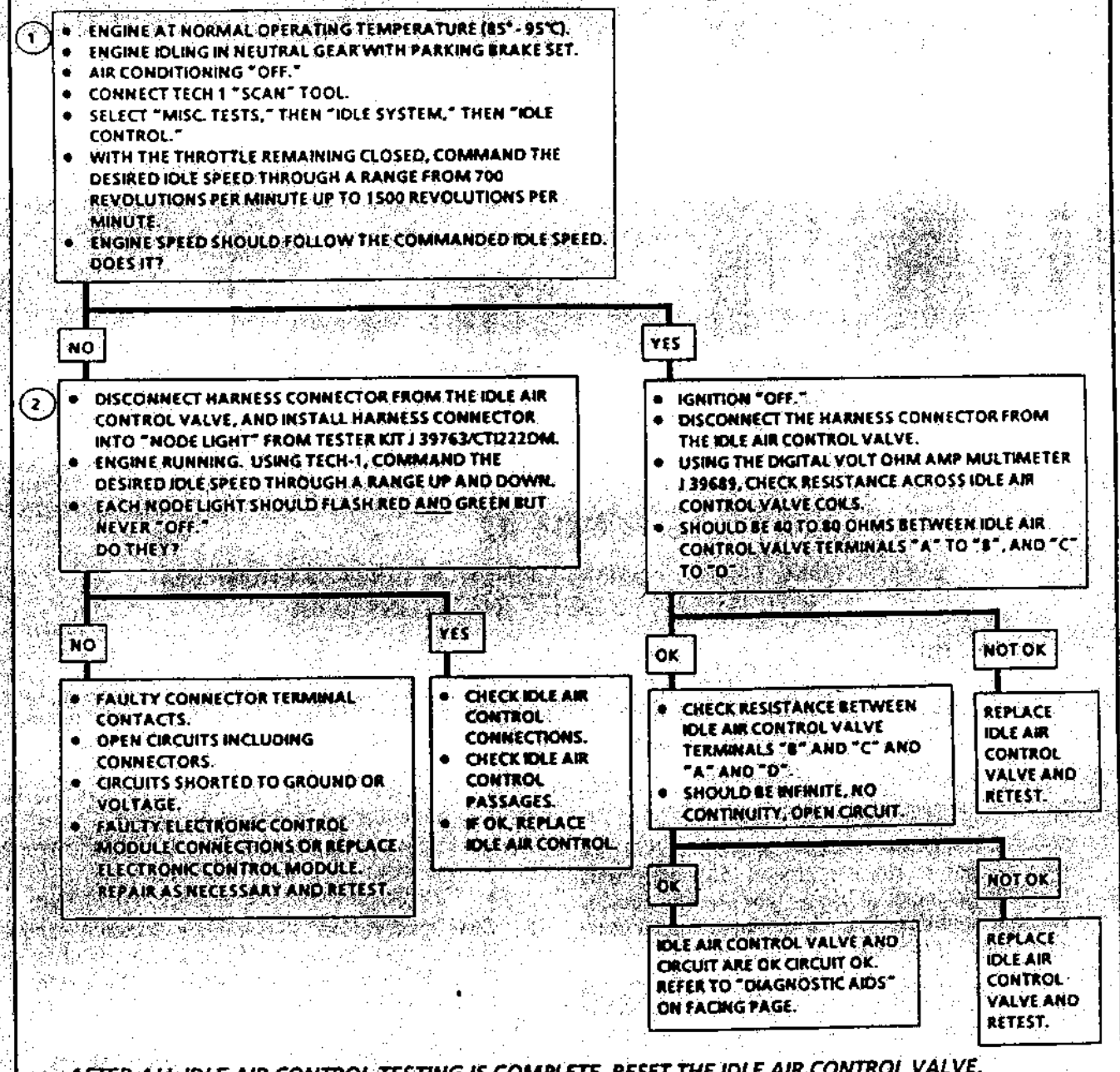
- **Vacuum Leak (High Idle)** - If idle is too high, stop the engine. Fully extend (low) idle air control with tester. Start engine. If idle speed is above 800 revolutions per minute, locate and correct vacuum leak including crankcase ventilation system. Also check for binding of throttle blade or linkage.
- **System too lean (High Air/Fuel Ratio)** - The idle speed may be too high or too low. Engine speed may vary up and down and disconnecting the idle air control valve does not help. Code 44 may be set. Tech 1 "Scan" tool oxygen voltage will be less than 300 mV (0.3 volt). Check for low regulated fuel pressure, water in the fuel or a restricted injector.
- **System too rich (Low Air/Fuel Ratio)** - The idle speed will be too low. Tech 1 "Scan" tool idle air control counts will usually be above 80. System is obviously rich and may exhibit black smoke in exhaust.

  Tech 1 "Scan" tool oxygen voltage will be fixed above 800 mV (.8 volt).

  Check for high fuel pressure, leaking or sticking injector. Silicone contaminated oxygen sensors Tech 1 "Scan" tool voltage will be slow to respond.
- **Throttle Body** - Remove idle air control valve and inspect bore for foreign material.
- **Idle Air Control Valve Electrical Connections** - Idle air control valve connections should be carefully checked for proper contact.
- **Crankcase Ventilation System** - An incorrect or faulty positive crankcase ventilation system may result in an incorrect idle speed. Refer to CHART C-13.
- Refer to "Rough, Unstable, Incorrect Idle or Stalling" in "Symptoms," Section "2.9B".
- If intermittent poor driveability or idle symptoms are resolved by disconnecting the idle air control, carefully recheck connections, valve terminal resistance or replace idle air control.

CODE 35

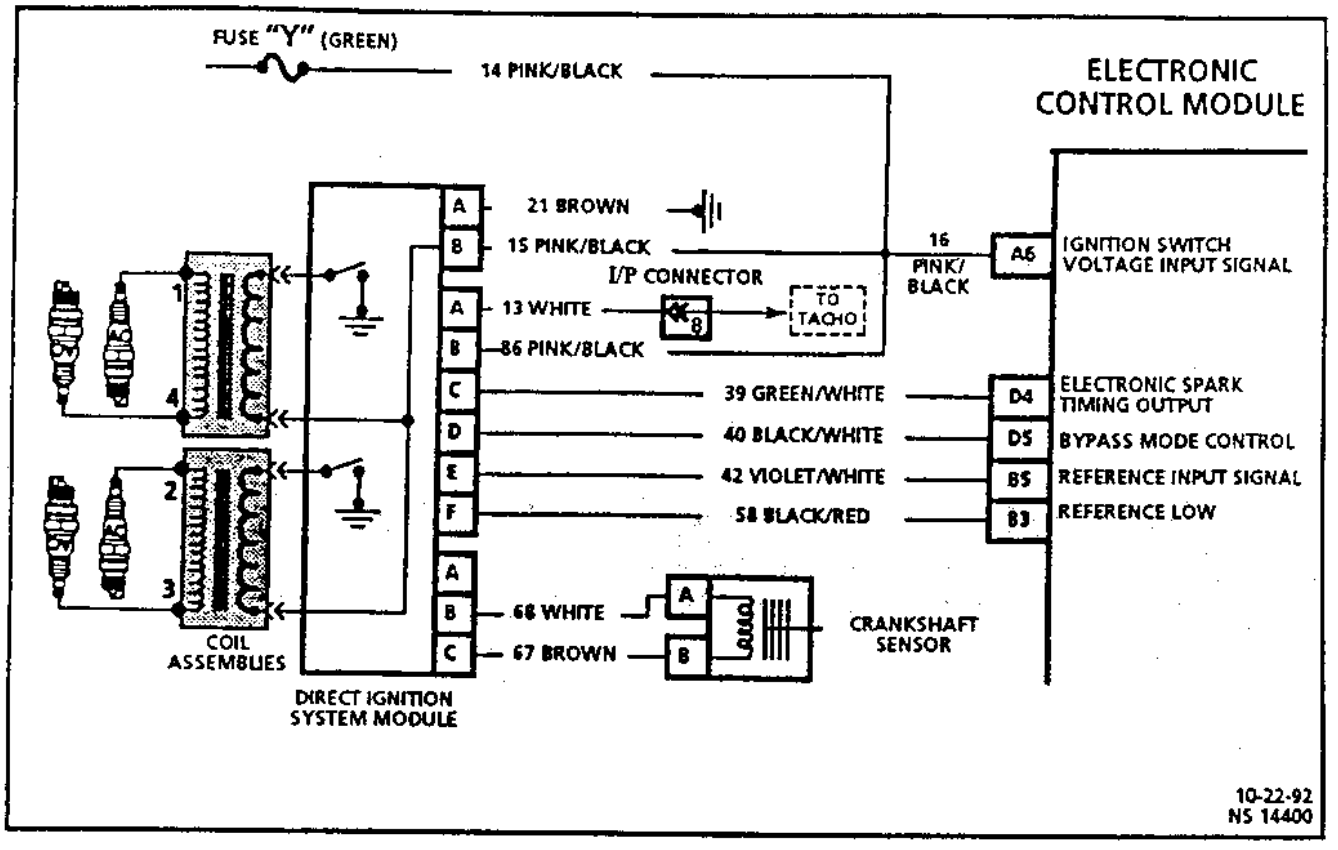
IDLE SPEED ERROR
1.7L THROTTLE BODY INJECTION NIVA


1
• ENGINE AT NORMAL OPERATING TEMPERATURE (85° - 95°C).
• ENGINE IDLING IN NEUTRAL GEAR WITH PARKING BRAKE SET.
• AIR CONDITIONING "OFF."
• CONNECT TECH 1 "SCAN" TOOL.
• SELECT "MISC. TESTS," THEN "IDLE SYSTEM," THEN "IDLE CONTROL."
• WITH THE THROTTLE REMAINING CLOSED, COMMAND THE DESIRED IDLE SPEED THROUGH A RANGE FROM 700 REVOLUTIONS PER MINUTE UP TO 1500 REVOLUTIONS PER MINUTE.
• ENGINE SPEED SHOULD FOLLOW THE COMMANDED IDLE SPEED. DOES IT?
NO
YES
2
• DISCONNECT HARNESS CONNECTOR FROM THE IDLE AIR CONTROL VALVE, AND INSTALL HARNESS CONNECTOR INTO "NODE LIGHT" FROM TESTER KIT J 39763/CT1222DM.
• ENGINE RUNNING. USING TECH-1, COMMAND THE DESIRED IDLE SPEED THROUGH A RANGE UP AND DOWN.
• EACH NODE LIGHT SHOULD FLASH RED AND GREEN BUT NEVER "OFF."
DO THEY?
NO
YES
• FAULTY CONNECTOR TERMINAL CONTACTS.
• OPEN CIRCUITS INCLUDING CONNECTORS.
• CIRCUITS SHORTED TO GROUND OR VOLTAGE.
• FAULTY ELECTRONIC CONTROL MODULE CONNECTIONS OR REPLACE ELECTRONIC CONTROL MODULE. REPAIR AS NECESSARY AND RETEST.
• CHECK IDLE AIR CONTROL CONNECTIONS.
• CHECK IDLE AIR CONTROL PASSAGES.
• IF OK, REPLACE IDLE AIR CONTROL.
• IGNITION "OFF."
• DISCONNECT THE HARNESS CONNECTOR FROM THE IDLE AIR CONTROL VALVE.
• USING THE DIGITAL VOLT OHM AMP MULTIMETER J 39689, CHECK RESISTANCE ACROSS IDLE AIR CONTROL VALVE COILS.
• SHOULD BE 40 TO 80 OHMS BETWEEN IDLE AIR CONTROL VALVE TERMINALS "A" TO "B", AND "C" TO "D".
OK
NOT OK
• CHECK RESISTANCE BETWEEN IDLE AIR CONTROL VALVE TERMINALS "B" AND "C" AND "A" AND "D".
• SHOULD BE INFINITE, NO CONTINUITY, OPEN CIRCUIT.
REPLACE IDLE AIR CONTROL VALVE AND RETEST.
OK
NOT OK
IDLE AIR CONTROL VALVE AND CIRCUIT ARE OK CIRCUIT OK. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
REPLACE IDLE AIR CONTROL VALVE AND RETEST.

AFTER ALL IDLE AIR CONTROL TESTING IS COMPLETE, RESET THE IDLE AIR CONTROL VALVE. CONNECT TECH 1, SELECT "MISC. TESTS," THEN "IDLE SYSTEM," THEN "IDLE RESET."

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

3-9-93
NS 14378



CODE 42

ELECTRONIC SPARK TIMING CONTROL CIRCUIT PROBLEM 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

Code 42 will set if the electronic control module detects an improper signal on either the bypass mode control circuit 40 Black/White wire or the electronic spark timing output circuit 39 Green/White wire when the engine is cranking or while running. Review the general description of the ignition system in Section 1.4.

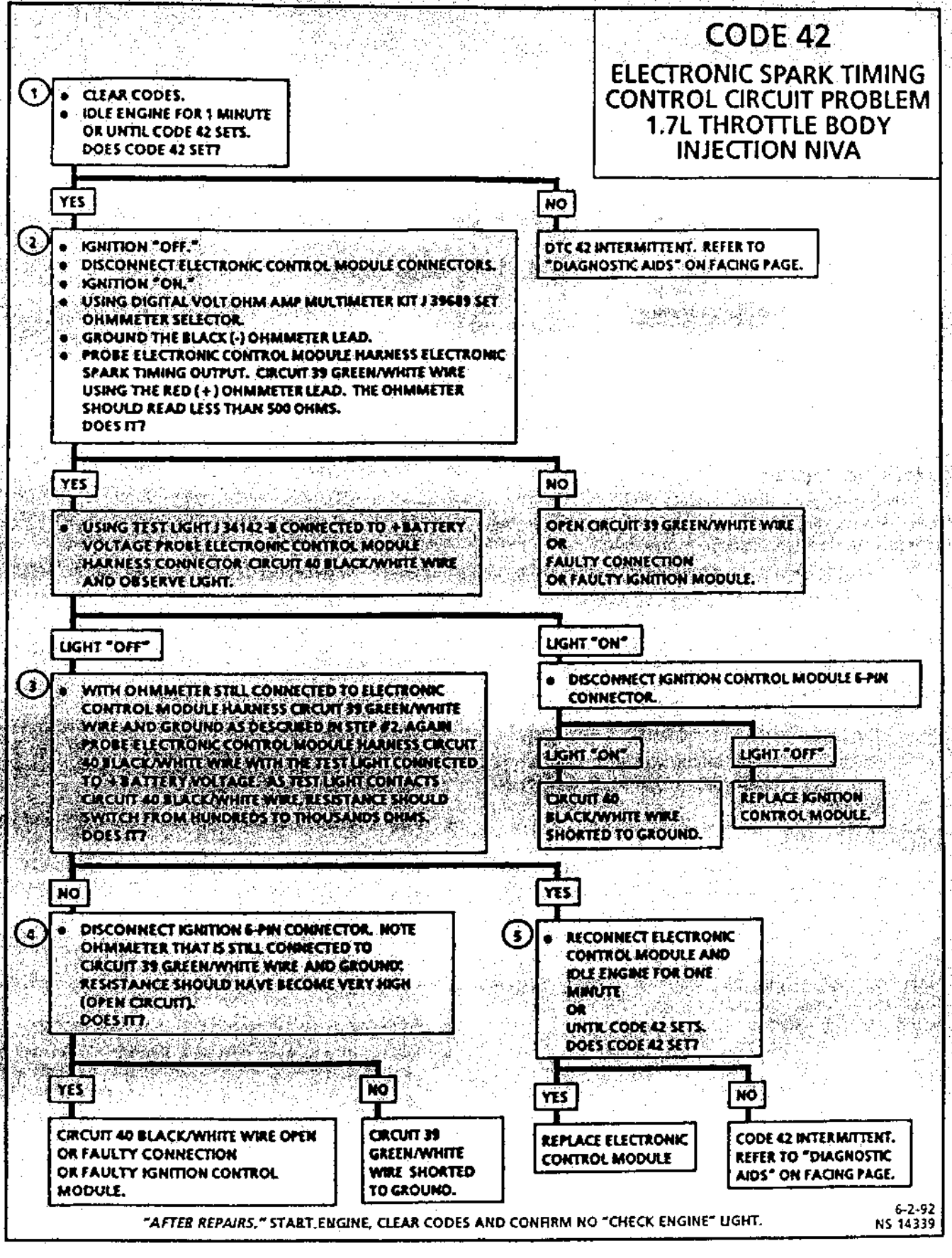
Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

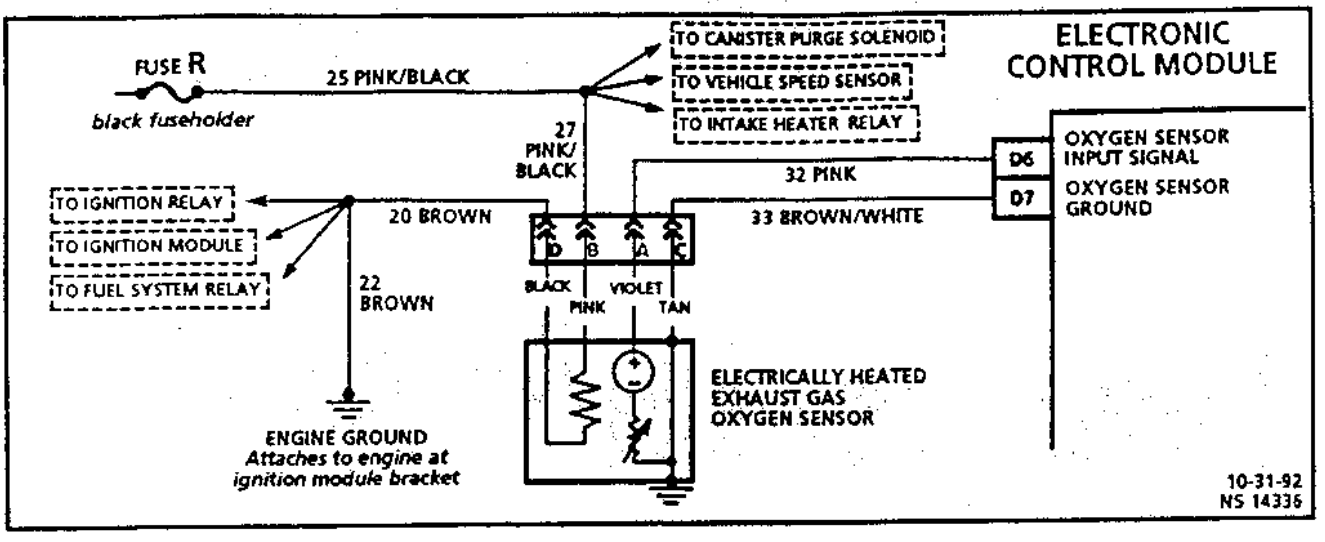
1. Code 42 means the electronic control module has seen an open or short to ground in the electronic spark timing output or bypass mode control circuits. This test confirms Code 42 and that the fault causing the code is present.
2. Checks for a normal electronic spark timing ground path through the ignition module. An electronic spark timing Circuit 39 Green/White wire shorted to ground will also read less than 500 ohms; however, this will be checked later.
3. As the test light voltage touches Circuit 40 Black/White wire, the module should switch, causing the ohmmeter to "switch ranges," if the meter is in the low ohms position. The important thing is that the module "switched" above 500 ohms.
4. The ignition module did not switch and this step checks for:
   - Electronic spark timing output Circuit 39 Green/White wire shorted to ground.
   - Bypass mode control Circuit 40 Black/White wire open.
   - Faulty ignition module connection or module.
5. Confirms that Code 42 is a faulty electronic control module and not an intermittent in Circuits 39 Green/White wire or Circuit 40 Black/White wire.

Diagnostic Aids:

An open or ground in the electronic spark timing circuit will result in the engine continuing to run, but in a "bypass" ignition timing mode (ignition module timing) at a calculated timing value and the "Check Engine" light will not be "ON." If the electronic spark timing fault is still present the next time the engine is restarted, a Code 42 will be set and the engine will operate in module timing.

If Code 42 is intermittent, refer to Section "2.9B".


CODE 42
ELECTRONIC SPARK TIMING CONTROL CIRCUIT PROBLEM 1.7L THROTTLE BODY INJECTION NIVA
1
• CLEAR CODES.
• IDLE ENGINE FOR 1 MINUTE OR UNTIL CODE 42 SETS. DOES CODE 42 SET?
YES
NO
DTC 42 INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
2
• IGNITION "OFF."
• DISCONNECT ELECTRONIC CONTROL MODULE CONNECTORS.
• IGNITION "ON."
• USING DIGITAL VOLT OHM AMP MULTIMETER KIT J 39689 SET OHMMETER SELECTOR.
• GROUND THE BLACK (-) OHMMETER LEAD.
• PROBE ELECTRONIC CONTROL MODULE HARNESS ELECTRONIC SPARK TIMING OUTPUT. CIRCUIT 39 GREEN/WHITE WIRE USING THE RED (+) OHMMETER LEAD. THE OHMMETER SHOULD READ LESS THAN 500 OHMS. DOES IT?
YES
NO
• USING TEST LIGHT J 34142-B CONNECTED TO +BATTERY VOLTAGE PROBE ELECTRONIC CONTROL MODULE HARNESS CONNECTOR CIRCUIT 40 BLACK/WHITE WIRE AND OBSERVE LIGHT.
OPEN CIRCUIT 39 GREEN/WHITE WIRE OR FAULTY CONNECTION OR FAULTY IGNITION MODULE.
LIGHT "OFF"
LIGHT "ON"
3
• WITH OHMMETER STILL CONNECTED TO ELECTRONIC CONTROL MODULE HARNESS CIRCUIT 39 GREEN/WHITE WIRE AND GROUND AS DESCRIBED IN STEP #2, AGAIN PROBE ELECTRONIC CONTROL MODULE HARNESS CIRCUIT 40 BLACK/WHITE WIRE WITH THE TEST LIGHT CONNECTED TO +BATTERY VOLTAGE. AS TEST LIGHT CONTACTS CIRCUIT 40 BLACK/WHITE WIRE, RESISTANCE SHOULD SWITCH FROM HUNDREDS TO THOUSANDS OHMS. DOES IT?
• DISCONNECT IGNITION CONTROL MODULE 6-PIN CONNECTOR.
LIGHT "ON"
LIGHT "OFF"
CIRCUIT 40 BLACK/WHITE WIRE SHORTED TO GROUND.
REPLACE IGNITION CONTROL MODULE.
NO
YES
4
• DISCONNECT IGNITION 6-PIN CONNECTOR. NOTE OHMMETER THAT IS STILL CONNECTED TO CIRCUIT 39 GREEN/WHITE WIRE AND GROUND. RESISTANCE SHOULD HAVE BECOME VERY HIGH (OPEN CIRCUIT). DOES IT?
5
• RECONNECT ELECTRONIC CONTROL MODULE AND IDLE ENGINE FOR ONE MINUTE OR UNTIL CODE 42 SETS. DOES CODE 42 SET?
YES
NO
YES
NO
CIRCUIT 40 BLACK/WHITE WIRE OPEN OR FAULTY CONNECTION OR FAULTY IGNITION CONTROL MODULE.
CIRCUIT 39 GREEN/WHITE WIRE SHORTED TO GROUND.
REPLACE ELECTRONIC CONTROL MODULE
CODE 42 INTERMITTENT. REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.
6-2-92
NS 14339



CODE 44

LEAN EXHAUST INDICATION
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The electronic control module applies a reference voltage of about 450 millivolts between terminals "D7" and "D6". The oxygen sensor varies the voltage within a range of about 1 volt, if the exhaust is rich, down through about 10 millivolt, if exhaust is lean. A lean exhaust condition will cause the oxygen sensor to output a low voltage.

The sensor is like an open circuit and produces no voltage when it is below about 315°C. An open sensor circuit, or cold sensor, causes "Open Loop" operation.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

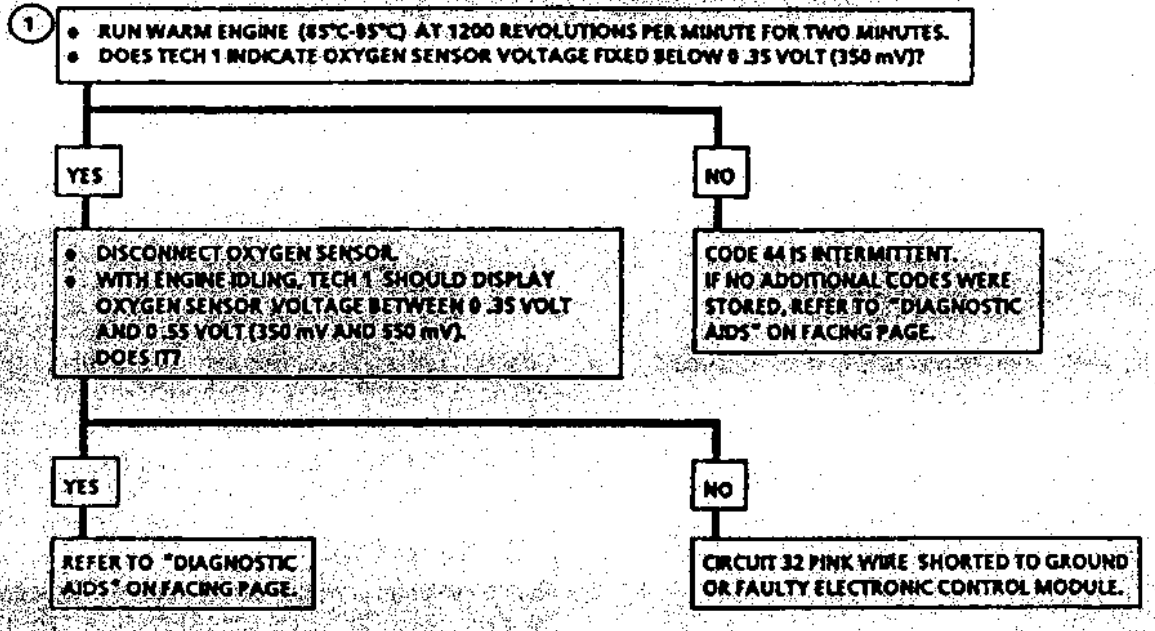
1. Code 44 is set if:
   - The fuel system is operating in "Closed Loop."
   - The oxygen sensor signal voltage on Circuit 32 Pink wire remains below 300 millivolts for 50 seconds.

Diagnostic Aids:

Using the Tech 1, observe the memory fuel adjustment values at different revolutions per minute and air flow conditions. The Tech 1 also displays the memory fuel adjustment cells, so the memory fuel adjustment values can be checked in each of the cells to determine when the Code 44 may have been set. If the conditions for Code 44 exist, the memory fuel adjustment values will be close to +50%.

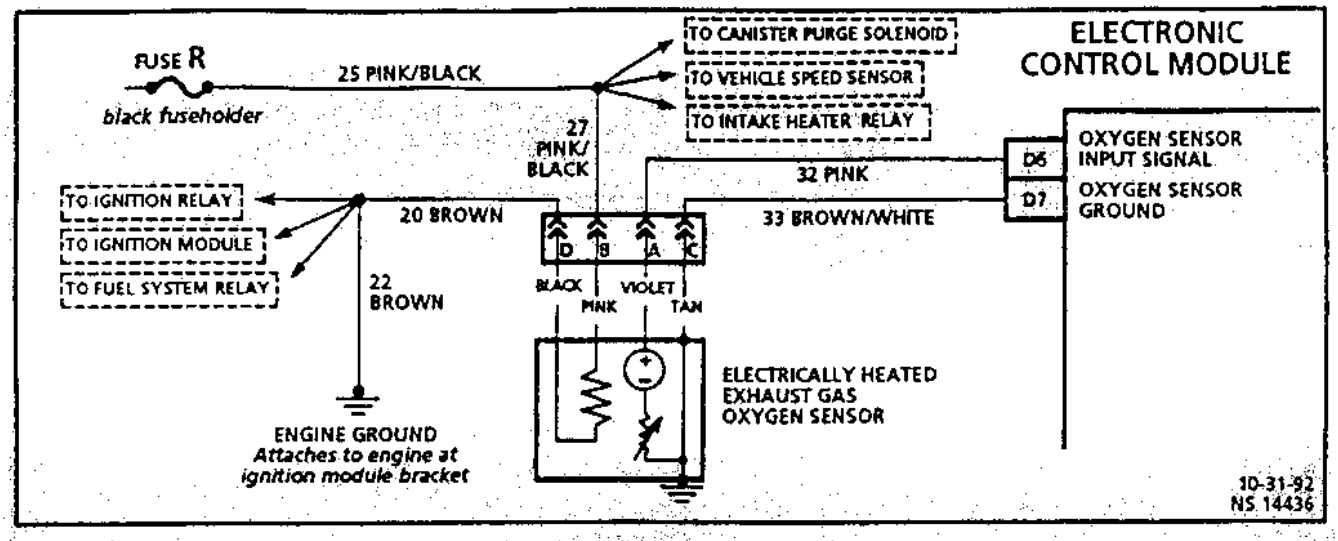
- Check for intermittent connection between connector and oxygen sensor.
- Poor connection at oxygen sensor ground wire.
- **Fuel Contamination:** Water, even in small amounts, near the in-tank fuel pump inlet can be delivered to the injector. The water causes a lean exhaust and can set a Code 44.
- **Fuel Pressure:** System will be lean if pressure is too low. It may be necessary to monitor fuel pressure while driving the vehicle at various road speeds and/or loads to confirm. Refer to Fuel System Diagnosis, CHART A-7.
- **Exhaust Leaks:** If there is an exhaust leak, the engine can cause outside air to be pulled into the exhaust leak and past the oxygen sensor. Vacuum or crankcase leaks can cause a lean condition.
- If the above are OK, it is a faulty oxygen sensor.
- **Manifold Absolute Pressure Sensor:** Check for a shifted sensor that could cause a lean exhaust but not set a Code 33 or 34. Refer to CHART C-ID.

CODE 44
LEAN EXHAUST INDICATION
1.7L THROTTLE BODY INJECTION NIVA


1
• RUN WARM ENGINE (85°C-95°C) AT 1200 REVOLUTIONS PER MINUTE FOR TWO MINUTES.
• DOES TECH 1 INDICATE OXYGEN SENSOR VOLTAGE FIXED BELOW 0 .35 VOLT (350 mV)?
YES
NO
• DISCONNECT OXYGEN SENSOR.
• WITH ENGINE IDLING, TECH 1 SHOULD DISPLAY OXYGEN SENSOR VOLTAGE BETWEEN 0 .35 VOLT AND 0 .55 VOLT (350 mV AND 550 mV).
DOES IT?
CODE 44 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
YES
NO
REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
CIRCUIT 32 PINK WIRE SHORTED TO GROUND OR FAULTY ELECTRONIC CONTROL MODULE.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-27-92
NS 14438



CODE 45
RICH EXHAUST INDICATION
1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The electronic control module applies a reference voltage of approximately 450 millivolts between terminals "D7" and "D6". The oxygen sensor varies the voltage within a range of about 1 volt, if the exhaust is rich, and down through about 10 millivolt, if exhaust is lean. A rich exhaust condition will cause the oxygen sensor to output a high voltage.

The sensor is like an open circuit and produces no voltage when it is below 315°C. An open sensor circuit, or a cold sensor causes "Open Loop" operation.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 45 is set if:
   - The fuel system is operating in "Closed Loop."
   - The oxygen sensor signal voltage on Circuit 32 Pink wire remains above 600 millivolts for 90 seconds.

Diagnostic Aids:

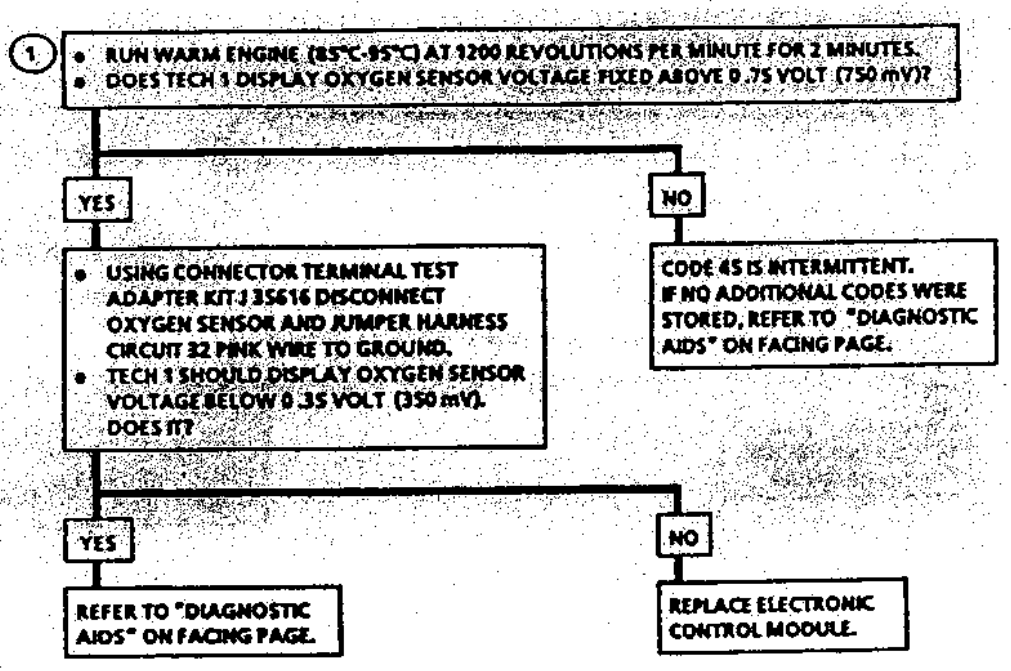
Using the Tech 1 "Scan" tool, observe the memory fuel adjustment values at different revolutions per minute and air flow conditions. The Tech 1 "Scan" tool also displays the memory fuel adjustment cells, so the memory fuel adjustment values can be checked in each of the cells to determine when the Code 45 may have been set. If the conditions for Code 45 exist, the memory fuel adjustment values will be close to -38.

- **Coolant Temperature Sensor:** Check for a shifted sensor that could cause a rich exhaust but not set Code 15, see Code 15 for sensor resistance values.
- **Throttle Position Sensor:** An intermittent throttle position sensor output will cause the system to go rich, due to a false indication of the engine accelerating. Refer to CHART C-1H.
- **Fuel Pressure:** System will go rich if pressure is too high. The electronic control module can compensate for some increase. However, if it gets too high, a Code 45 may be set.

  Check for a pinched fuel return line, or plugged vacuum hose to fuel pressure regulator. See Fuel System Diagnosis, CHART A-7.
- **Leaking Injector:** Refer to CHART A-7.

  Check for fuel contaminated oil.
- **Canister Purge:** Check for fuel saturation. If full of fuel, check canister control and hoses. Refer to CHART C-3.
- **Manifold Absolute Pressure Sensor:** Check for a shifted sensor that could cause a rich exhaust but not set a Code 33 or 34. Refer to CHART C-1D.

CODE 45
RICH EXHAUST INDICATION
1.7L THROTTLE BODY INJECTION NIVA

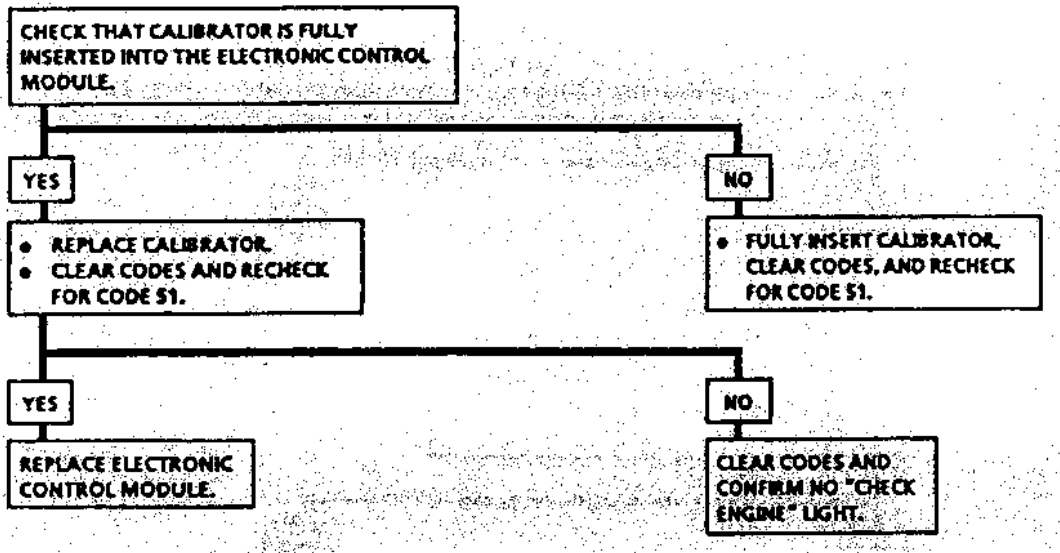

1
• RUN WARM ENGINE (85°C-95°C) AT 1200 REVOLUTIONS PER MINUTE FOR 2 MINUTES.
• DOES TECH 1 DISPLAY OXYGEN SENSOR VOLTAGE FIXED ABOVE 0.75 VOLT (750 mV)?
YES
NO
• USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616 DISCONNECT OXYGEN SENSOR AND JUMPER HARNESS CIRCUIT 32 PINK WIRE TO GROUND.
• TECH 1 SHOULD DISPLAY OXYGEN SENSOR VOLTAGE BELOW 0.35 VOLT (350 mV). DOES IT?
CODE 45 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
YES
NO
REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
REPLACE ELECTRONIC CONTROL MODULE.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

6-2-92
NS 14439

CODE 51

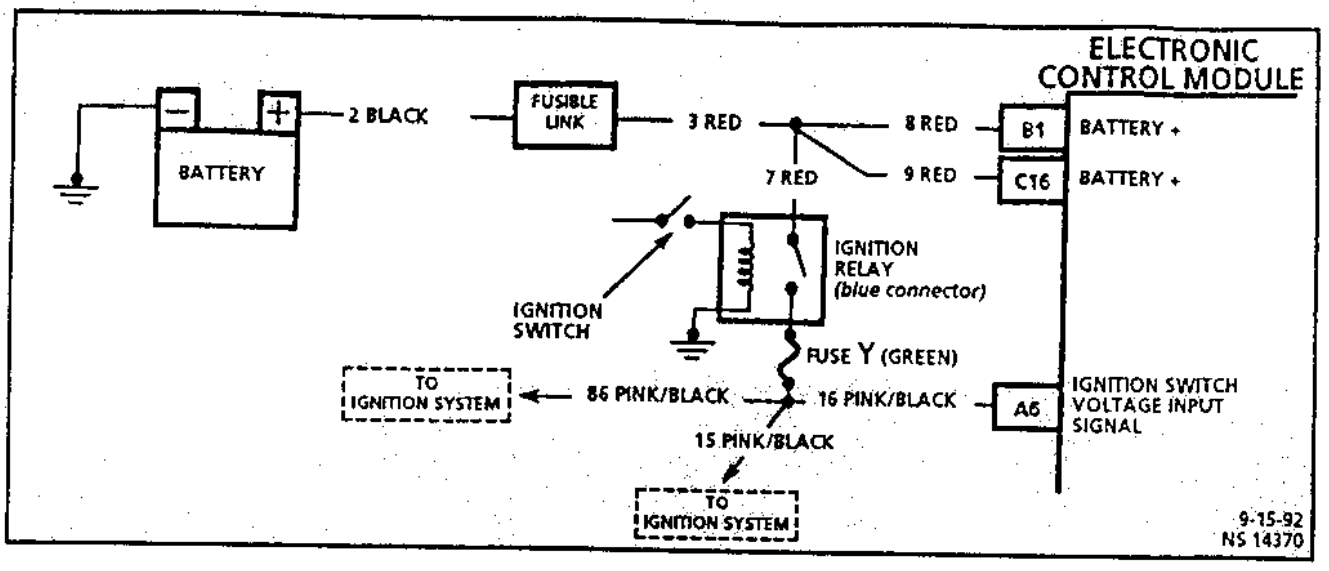
CALIBRATOR ERROR
1.7L THROTTLE BODY INJECTION NIVA


CHECK THAT CALIBRATOR IS FULLY INSERTED INTO THE ELECTRONIC CONTROL MODULE.
YES
NO
• REPLACE CALIBRATOR.
• CLEAR CODES AND RECHECK FOR CODE 51.
• FULLY INSERT CALIBRATOR, CLEAR CODES, AND RECHECK FOR CODE 51.
YES
NO
REPLACE ELECTRONIC CONTROL MODULE.
CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

5-27-92
NS 14443

BLANK



CODE 53

SYSTEM VOLTAGE TOO HIGH 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

Code 53 will set if the engine is running and the battery voltage is more than 16.9 volts for one second on electronic control module terminal "A6." During the time the fault is present, all electronic control module outputs will be disengaged and setting of additional codes may result.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

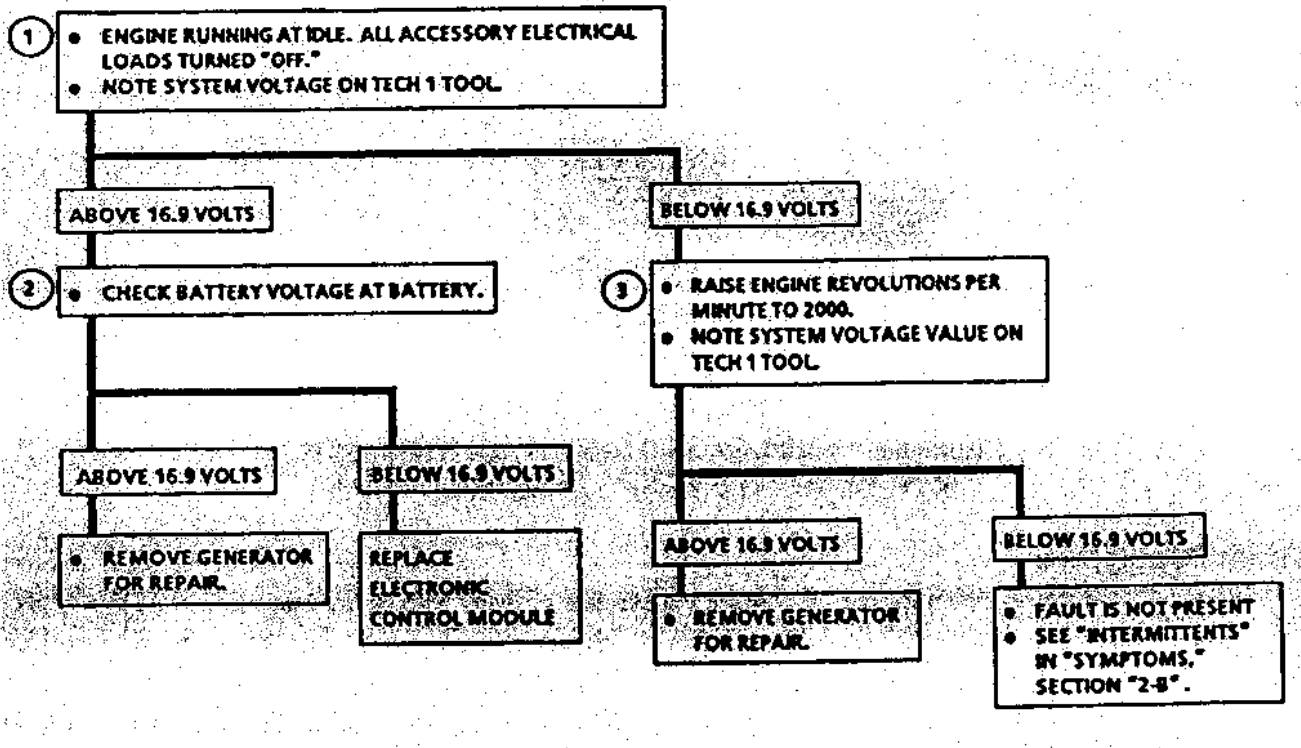
1. Normal battery output is between 12-15 volts..
2. Checks to see if the high voltage reading is due to the generator or incorrect interpretation by the electronic control module. With engine running, check voltage at the battery.
3. Checks to see if generator is faulty at higher engine speed.

Diagnostic Aids:

During the time the failure is present, all electronic control module outputs except the fuel injector and fuel system relay, will be disengaged to protect the hardware. The setting of additional codes may result.

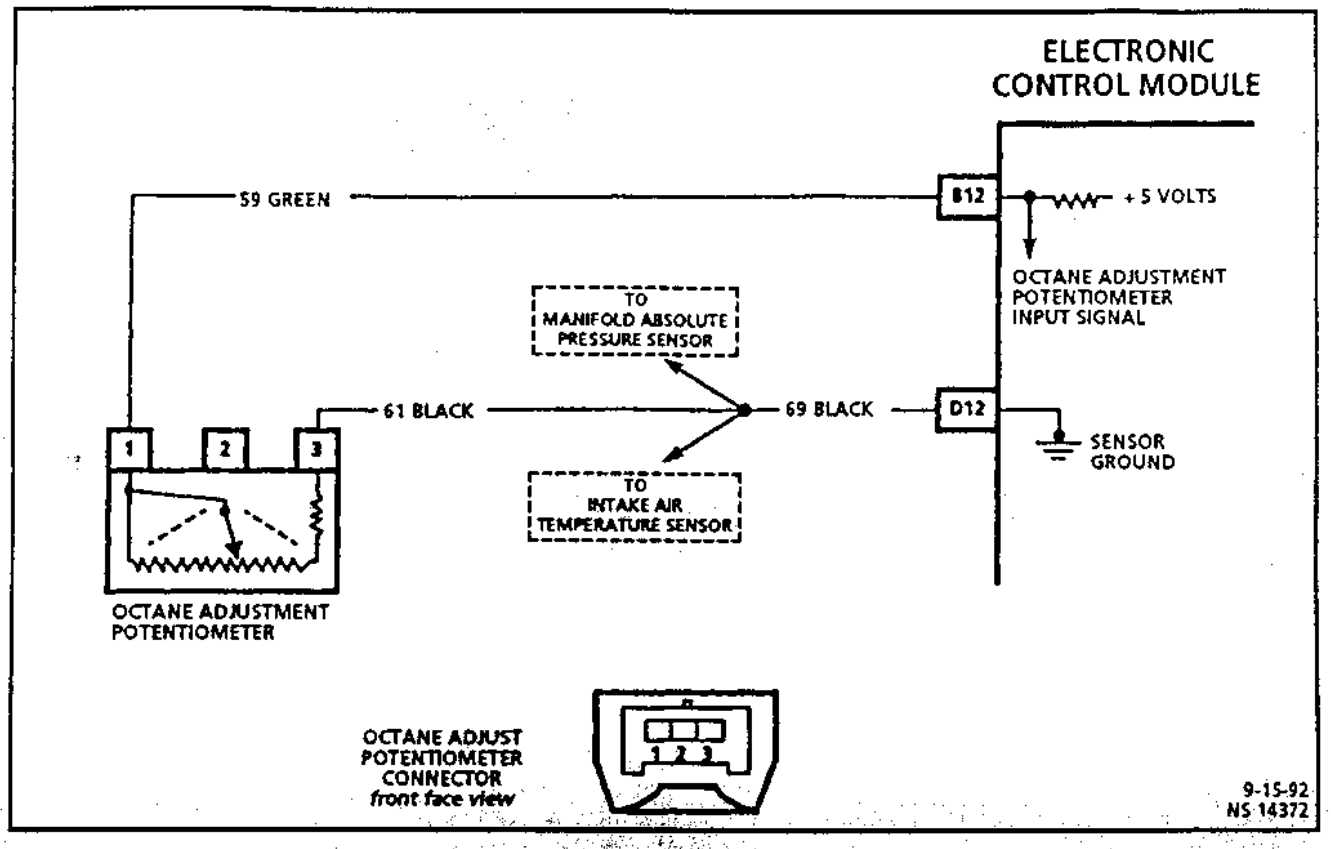
CODE 53

SYSTEM VOLTAGE TOO HIGH
1.7L THROTTLE BODY INJECTION NIVA


1
• ENGINE RUNNING AT IDLE. ALL ACCESSORY ELECTRICAL LOADS TURNED "OFF."
• NOTE SYSTEM VOLTAGE ON TECH 1 TOOL.
ABOVE 16.9 VOLTS
BELOW 16.9 VOLTS
2
• CHECK BATTERY VOLTAGE AT BATTERY.
3
• RAISE ENGINE REVOLUTIONS PER MINUTE TO 2000.
• NOTE SYSTEM VOLTAGE VALUE ON TECH 1 TOOL.
ABOVE 16.9 VOLTS
BELOW 16.9 VOLTS
• REMOVE GENERATOR FOR REPAIR.
REPLACE ELECTRONIC CONTROL MODULE
ABOVE 16.9 VOLTS
BELOW 16.9 VOLTS
• REMOVE GENERATOR FOR REPAIR.
• FAULT IS NOT PRESENT
• SEE "INTERMITTENTS" IN "SYMPTOMS," SECTION "2-8".

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

6-2-92
NS 14371



CODE 54

(Page 1 of 2)

OCTANE ADJUSTMENT (SIGNAL VOLTAGE TOO HIGH OR TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The octane adjustment potentiometer provides a voltage that changes with an adjustment screw. The voltage is adjustable from about 1 volt to about 4.7 volts. The engine must be running to allow the Tech 1 to read this voltage correctly.

The octane adjustment voltage acts as an ignition timing spark retard which allows for adjustments when low octane fuel produces spark knock.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

1. Code 54 will set if:
   - The octane adjustment signal voltage is less than 0.5 volts or greater than 4.9 volts for approximately 2 seconds.
2. With the octane adjust potentiometer disconnected from the electronic control module the Tech 1 should read close to 5 volts.

Diagnostic Aids:

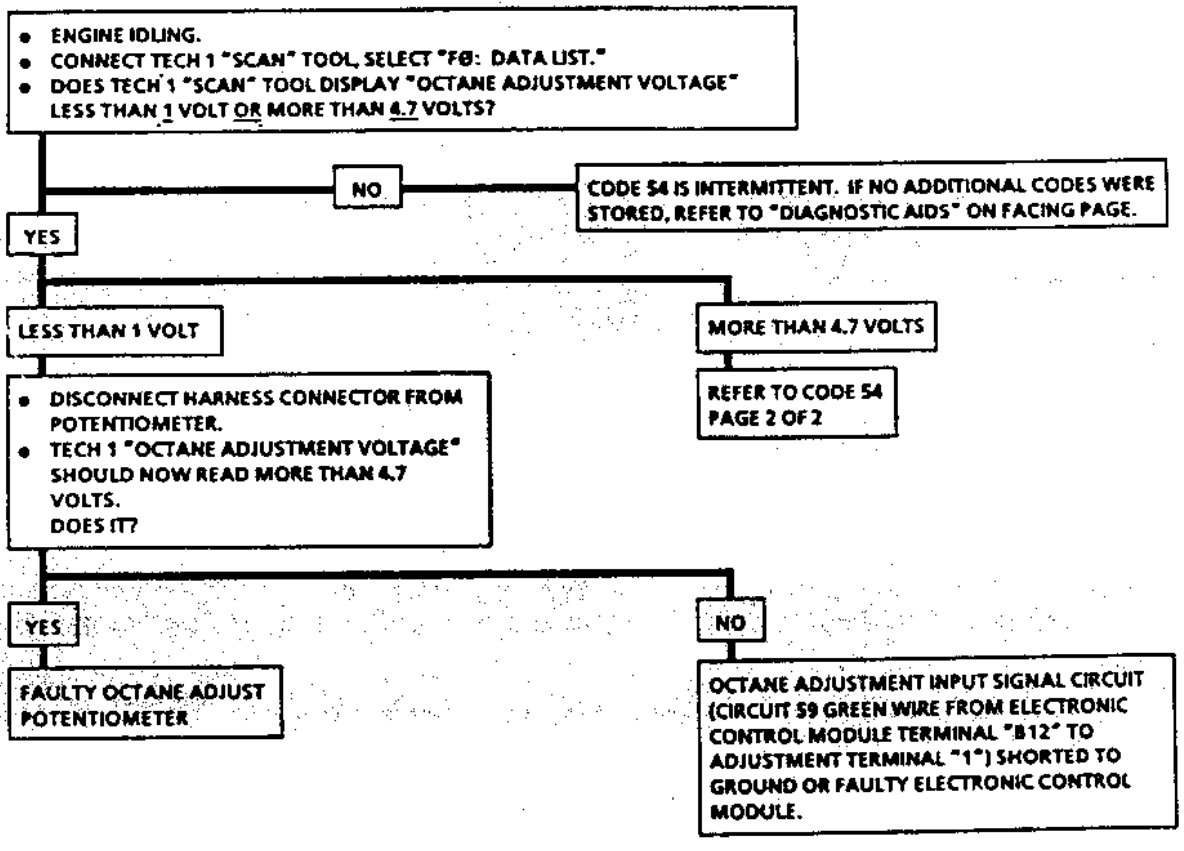
An open or short to ground in the octane adjustment circuit wires will result in a Code 54, and/or Code 23, Code 33.

Refer to "Intermittents" in "Symptoms," Section "2.9B."

CODE 54

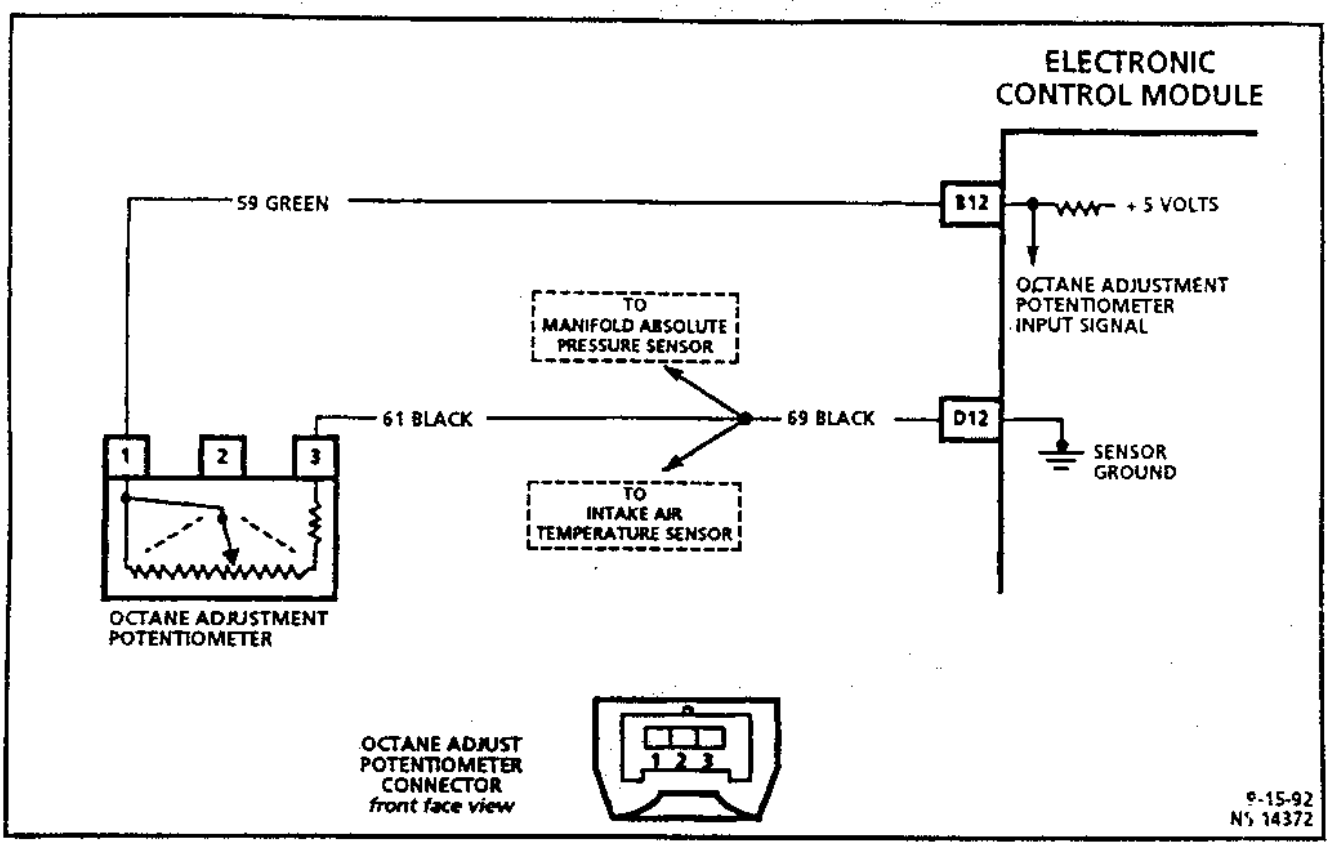
(Page 1 of 2)

OCTANE ADJUSTMENT (SIGNAL VOLTAGE TOO HIGH OR TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA


• ENGINE IDLING.
• CONNECT TECH 1 "SCAN" TOOL, SELECT "F0: DATA LIST."
• DOES TECH 1 "SCAN" TOOL DISPLAY "OCTANE ADJUSTMENT VOLTAGE" LESS THAN 1 VOLT OR MORE THAN 4.7 VOLTS?
NO
CODE 54 IS INTERMITTENT. IF NO ADDITIONAL CODES WERE STORED, REFER TO "DIAGNOSTIC AIDS" ON FACING PAGE.
YES
LESS THAN 1 VOLT
MORE THAN 4.7 VOLTS
REFER TO CODE 54 PAGE 2 OF 2
• DISCONNECT HARNESS CONNECTOR FROM POTENTIOMETER.
• TECH 1 "OCTANE ADJUSTMENT VOLTAGE" SHOULD NOW READ MORE THAN 4.7 VOLTS.
DOES IT?
YES
FAULTY OCTANE ADJUST POTENTIOMETER
NO
OCTANE ADJUSTMENT INPUT SIGNAL CIRCUIT (CIRCUIT 59 GREEN WIRE FROM ELECTRONIC CONTROL MODULE TERMINAL "B12" TO ADJUSTMENT TERMINAL "1") SHORTED TO GROUND OR FAULTY ELECTRONIC CONTROL MODULE.

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

2-5-93
NS 14373



CODE 54

(Page 2 of 2)
OCTANE ADJUSTMENT (SIGNAL VOLTAGE TOO HIGH OR TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

Circuit Description:

The octane adjustment potentiometer provides a voltage that changes with an adjustment screw. The voltage is adjustable from about 1 volt to about 4.7 volts. The engine must be running to allow the Tech 1 to read this voltage correctly.

The octane adjustment voltage acts as an ignition timing spark retard ratio trim pot which allows for adjustments when low octane fuel produces spark knock.

Test Description: Number(s) below refer to circled number(s) on the diagnostic chart.

3. This step checks for a short to voltage or a potentially bad octane adjust potentiometer.
4. This step checks for an open ground circuit between the electronic control module and octane adjust potentiometer terminal "3".
5. This will determine if there is an open in the input signal wire, faulty connections or a potentially bad electronic control module.

CODE 54

(Page 2 of 2)

OCTANE ADJUSTMENT (SIGNAL VOLTAGE TOO HIGH OR TOO LOW) 1.7L THROTTLE BODY INJECTION NIVA

CONTINUED FROM CODE 54 PAGE 1 OF 2

TECH 1 DISPLAYS "OCTANE ADJUSTMENT VOLTAGE" ABOVE 4.7 VOLTS.

- DISCONNECT HARNESS CONNECTOR FROM OCTANE ADJUST POTENTIOMETER.
- USING CONNECTOR TERMINAL TEST ADAPTER KIT J 35616, CONNECT HARNESS TERMINALS "1" AND "3" TOGETHER.
- ENGINE IDLING.
- TECH 1 SHOULD NOW DISPLAY "OCTANE ADJUSTMENT VOLTAGE" LESS THAN 1 VOLT.

DOES IT? (3)

NO (4)

- REMOVE JUMPER WIRE FROM BETWEEN OCTANE ADJUST POTENTIOMETER HARNESS TERMINALS "1" AND "3".
- USING CONNECTOR TEST ADAPTER KIT J 35616, CONNECT OCTANE ADJUST POTENTIOMETER HARNESS TERMINAL "1" TO GROUND. (CIRCUIT 59 GREEN WIRE.)
- ENGINE IDLING.
- TECH 1 SHOULD NOW DISPLAY "OCTANE ADJUSTMENT VOLTAGE" LESS THAN 1 VOLT.

DOES IT?

YES

CHECK FOR SHORT CIRCUIT TO ALTERNATIVE VOLTAGE SOURCE ON INPUT SIGNAL WIRE (CIRCUIT 59 GREEN WIRE BETWEEN ELECTRONIC CONTROL MODULE AND "OCTANE ADJUST POTENTIOMETER HARNESS TERMINAL "1" AND ELECTRONIC CONTROL MODULE TERMINAL "B12"). IF NONE FOUND REPLACE OCTANE ADJUST POTENTIOMETER AND RETEST. SEE SECTION 3.1 FOR REPLACE AND ADJUST PROCEDURE.

NO (5)

- AT ELECTRONIC CONTROL MODULE BACKPROBE CONNECTOR "B12" WITH A TEST LIGHT CONNECTED TO GROUND. LEAVE TEST LIGHT IN PLACE WHILE OBSERVING TECH 1 DISPLAY.
- ENGINE IDLING.
- TECH 1 SHOULD NOW DISPLAY "OCTANE ADJUSTMENT VOLTAGE" LESS THAN 1 VOLT.

DOES IT?

YES

REPAIR OPEN SENSOR GROUND CIRCUIT (BLACK WIRE) BETWEEN ELECTRONIC CONTROL MODULE TERMINAL "D2" AND OCTANE ADJUST POTENTIOMETER HARNESS CONNECTOR TERMINAL "3".

NO

FAULTY CONNECTIONS
OR
FAULTY ELECTRONIC CONTROL MODULE.

YES

REPAIR OPEN CIRCUIT IN INPUT SIGNAL WIRE (CIRCUIT 59 GREEN WIRE) BETWEEN TERMINAL "B12" AND OCTANE ADJUST POTENTIOMETER HARNESS TERMINAL "1".

"AFTER REPAIRS," START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.

2-8-93
NS 15695

CODE 55
ELECTRONIC CONTROL MODULE ERROR

FAULTY ELECTRONIC CONTROL MODULE.

REPLACE ELECTRONIC CONTROL MODULE

"AFTER REPAIRS," **START ENGINE, CLEAR CODES AND CONFIRM NO "CHECK ENGINE" LIGHT.**

5-27-92
NS 14981

SECTION 2.9B

SYMPTOM CHARTS

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IMPORTANT PRELIMINARY CHECKS

- Before using this section you should have performed the "Diagnostic Circuit Check."
- Verify the customer complaint, and locate the correct symptom. Check the items indicated under that symptom.
- If the ENGINE CRANKS BUT WILL NOT RUN, use CHART A-3.
- Several of the following symptom procedures call for a careful visual/physical check.

The importance of this step cannot be stressed too strongly—it can lead to correcting a problem without further checks and can save valuable time.

BEFORE STARTING

This check should include:

- Electronic control module grounds for being clean, tight, and in their proper location.
- Vacuum hoses for splits, kinks and proper connections. Check thoroughly for any type of leak or restriction.
- Air leaks at throttle body mounting area and intake manifold sealing surfaces (also check intake manifold Electric Heater's mounting bolts for proper tightness).
- Ignition wires for cracking, hardness, proper routing and carbon tracking.
- Wiring for proper connections, pinches, and cuts.

  If wiring harness or connector repair is necessary, refer to "Service Operations," Section "3" for correct procedure.

INTERMITTENTS

(Page 1 of 2)

Definition: Problem may or may not turn "ON" the "Check Engine" light, or store a code.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.

DIAGNOSTIC CODE CHARTS IN "DIAGNOSTIC CHARTS," SECTION "2.9-A"

- DO NOT use the Diagnostic Code Charts in "Diagnostic Charts," Section "2.9-A" for intermittent problems. The fault must be present to locate the problem. If a fault is intermittent, use of diagnostic code charts may result in replacement of good parts.

FAULTY ELECTRICAL CONNECTIONS OR WIRING

- Most intermittent problems are caused by faulty electrical connections or wiring. Perform a careful check of suspect circuits for:
  - Poor mating of the connector halves, or terminals, not fully seated in the connector body (backed out).
  - Improperly formed or damaged terminals. All connector terminals in problem circuit should be carefully reformed or replaced to insure proper contact tension.
  - Poor terminal to wire connection. This requires removing the terminal from the connector body to check. See "Service Operations" Section "3," "Wiring Harness Service."

ROAD TEST

- If a visual/physical check does not find the cause of the problem, the vehicle can be driven with a voltmeter connected to a suspected circuit or a Tech 1 "Scan" tool may be used. An abnormal voltage or Tech 1 "Scan" tool reading when the problem occurs indicates the problem may be in that circuit.

  The Tech 1 "Scan" tool has a special mode called "snapshot." This snapshot mode can be used to capture electronic control module serial data when a problem occurs, so that the technician can play back the data one event at a time to look for erroneous data when the fault occurred. For more information on the snapshot mode, refer to the Tech 1 operator's manual.

INTERMITTENTS

(Page 2 of 2)

Definition: Problem may or may not turn "ON" the "Check Engine" light, or store a code.

INTERMITTENT "CHECK ENGINE" LIGHT

- As intermittent "Check Engine" light, and No Diagnostic Codes, may be caused by:
  - Electrical system interference caused by a defective relay, electronic control module driven solenoid, or switch. They can cause a sharp electrical surge. Normally, the problem will occur when the faulty component is operated.
  - Improper installation of electrical options, such as lights, 2-way radios, etc.
  - Electronic spark timing wires not properly routed away from spark plug wires, ignition system components and generator.
  - Ignition secondary shorted to ground.
  - "Check Engine" light circuit or diagnostic "test" terminal circuit intermittently shorted to ground.
  - Electronic control module grounds not clean, tight, and in their proper location. These ground wires secure to the engine block on the direct ignition system bracket uppermost bolt. This bolt was previously used to retain the distributor on a carbureted engine.

LOSS OF DIAGNOSTIC CODE MEMORY

- To check, disconnect throttle position sensor and idle engine until "Check Engine" light comes "ON." Code 22 should be stored and kept in memory, when the ignition is turned "OFF" longer than 10 seconds. If Code 22 is not stored, the electronic control module is faulty.

HARD START

(Page 1 of 2)

Definition: Engine cranks OK, but does not start for a long time. Does eventually run, or may start but immediately dies.

PRELIMINARY CHECKS

- Perform the careful visual/physical checks as described at start of "Symptoms," in this section.
- Make sure the driver is using the correct starting procedure. This includes depressing and holding the clutch pedal down while cranking to start. When starting the engine at very cold temperatures of below -10°C, the accelerator pedal should be held down 1/4 of the way while cranking to start, as well as depressing the clutch pedal.

SENSORS

- **CHECK:** Coolant temperature sensor—Using a Tech 1 "Scan" tool, compare coolant temperature with ambient temperature on a cold engine.
  - If coolant temperature reading is 2°C greater than or less than ambient air temperature on a cold engine, check for high resistance in coolant sensor circuit or sensor itself. Compare resistance value to the "Diagnostic Aids" chart on the Code 14 or Code 15 chart.
- **CHECK:** Throttle position sensor—use CHART C-1H.
- **CHECK:** Manifold absolute pressure sensor—use CHART C-1D.

FUEL SYSTEM

- **CHECK:** In-line fuel filter. Replace if dirty or plugged.
- **CHECK:** For poor quality fuel.
- **CHECK:** Fuel pressure, use CHART A-7.
- **CHECK:** For contaminated fuel.
- **CHECK:** Fuel system relay—Connect test light between fuel pump "test" terminal and ground. Test light should be "ON" for 2 seconds following ignition "ON," after ignition switch has been "OFF" for at least 10 seconds. If not OK, use CHART A-5.
- **CHECK:** Operation of intake manifold electrical heater (see: CHART C-9).

IGNITION SYSTEM

- **CHECK:** Ignition system for:
  - Proper ignition voltage output with spark tester J 26792 (ST-125).
  - Spark plugs, wet plugs, cracks, wear, improper gap, burned electrodes or heavy deposits.
  - Crankshaft sensor resistance and connections.
  - Spark plug leads/wires for excessive resistance.
  - Bare and shorted wires.
  - Loose ignition coil connections.
- **CHECK:** Electronic spark timing output circuit for short to ground.

HARD START

(Page 2 of 2)

Definition: Engine cranks OK, but does not start for a long time. Does eventually run, or may start but immediately dies.

ADDITIONAL CHECKS

- **CHECK:** Idle air control operation, use CHART C-2C.
- **CHECK:** For correct engine calibrator (see "Service Bulletins").

CRANKING AND CHARGING SYSTEMS, AND CONDITION OF BATTERY

- **CHECK:** For low cranking speeds that can cause difficult starting. Use the Tech 1 "Scan" tool in the "Miscellaneous Tests" - "Crank Tests" mode to monitor cranking speed information.